

EPA Superfund
Record of Decision:

CRYOCHEM, INC.
EPA ID: PAD002360444
OU 02
WORMAN TOWNSHIP, PA
09/28/1990

Text:

- * OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY, AND
- * OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER AND SOURCE AREA

AFTER EPA ISSUED THE PROPOSED PLAN, WHICH DESCRIBED THE RESPONSE ACTION EPA PREFERRED TO IMPLEMENT FOR OU2, AND UPON REVIEW OF ADDITIONAL INFORMATION WHICH BECAME AVAILABLE TO EPA DURING THE 30-DAY PUBLIC COMMENT PERIOD FOR OU2, EPA DETERMINED THAT ADDITIONAL ALTERNATIVES TO REMEDIATE CONTAMINATED SOIL AT THE SITE SHOULD BE DEVELOPED AND THE PUBLIC SHOULD BE PROVIDED THE OPPORTUNITY TO REVIEW AND COMMENT ON THESE REMEDIAL ALTERNATIVES. THUS, EPA HAS DECIDED TO FURTHER SEPARATE RESPONSE ACTIVITIES AT THE SITE INTO ANOTHER OPERABLE UNIT. THE THIRD OPERABLE UNIT (OU3) WILL CONSIST ONLY OF THE "SOURCE AREA" (SOIL) COMPONENT OF THE REMEDIAL ALTERNATIVES DESCRIBED IN THE PROPOSED PLAN FOR OU2. THE OPERABLE UNITS DEVELOPED FOR THE SITE NOW ARE:

OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY,
OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER, AND
OPERABLE UNIT 3 (OU3) - SOURCE AREA (SOIL)

A NEW PROPOSED PLAN FOR OU3 WILL BE SENT TO THE PUBLIC IN THE NEAR FUTURE, AND THE PUBLIC WILL BE GIVEN THE OPPORTUNITY TO REVIEW AND COMMENT ON THE ADDITIONAL REMEDIAL ALTERNATIVES DEVELOPED BY EPA FOR CONTAMINATED SOIL AT THE SITE. EPA ANTICIPATES THAT A PROPOSED PLAN FOR OU3 WILL BE SENT TO THE PUBLIC IN NOVEMBER 1990. THE RATIONALE FOR DEVELOPING THREE, RATHER THAN TWO, OPERABLE UNITS FOR THE SITE IS EXPLAINED IN DETAIL WITHIN SECTION IX ("DOCUMENTATION OF SIGNIFICANT CHANGES") OF THIS ROD.

TO THE MAXIMUM EXTENT PRACTICABLE, THE REMEDY SELECTED FOR OU2 WILL BE CONSISTENT AND COMPATIBLE WITH THE REMEDY PREVIOUSLY SELECTED FOR OU1. THE REMEDY FOR OU1 IS EMBODIED IN THE RECORD OF DECISION EXECUTED WITHIN A ROD BY EPA ON SEPTEMBER 29, 1989. THE REMEDY FOR OU1 INCLUDES INSTALLATION AND OPERATION OF A NEW WATER SUPPLY WELL, LOCATED OUTSIDE THE PLUME OF CONTAMINATION, TO DELIVER CLEAN DRINKING WATER TO RESIDENTS AFFECTED AND POTENTIALLY AFFECTED BY CONTAMINANTS MIGRATING FROM THE SITE. THE REMEDY FOR OU2 CONSIDERS THE LOCATION OF THE NEW WATER SUPPLY WELL AND INCLUDES PRECAUTIONS TO ENSURE THAT THE GROUND WATER EXTRACTION SYSTEM OPERATED FOR OU2 WILL NOT REDUCE THE YIELD OF THE NEW WATER SUPPLY WELL AND WILL NOT CAUSE CONTAMINANTS TO MIGRATE TOWARD THE NEW WATER SUPPLY WELL. EPA BELIEVES THAT THE REMEDY FOR OU2 IS FLEXIBLE ENOUGH TO ACCOMMODATE ANY POSSIBLE MODIFICATIONS TO THE REMEDY FOR OU1, E.G., INCREASED WATER DEMAND OR OBTAINING WATER FROM A TREATMENT SYSTEM INSTALLED AS PART OF OU2. IN ADDITION, EPA BELIEVES THAT REMEDIATION OF CONTAMINATED SOIL BEHIND THE CRYOCHEM, INC. FABRICATION BUILDING (OU3) WILL BE ENHANCED BY THE REMEDY SELECTED FOR OU2. FOR EXAMPLE, THE REMEDY FOR OU2 WOULD RESULT IN A LOWER WATER TABLE BEHIND THE FABRICATION BUILDING THUS ALLOWING MORE SOIL TO BE DRAINED AND REMEDIATED.

#SLD

II. SITE NAME, LOCATION, AND DESCRIPTION

THE CRYOCHEM SITE IS LOCATED IN THE VILLAGE OF WORMAN, EARL TOWNSHIP, BERKS COUNTY, PENNSYLVANIA, APPROXIMATELY 3 MILES WEST OF BOYERTOWN, BERKS COUNTY, PENNSYLVANIA. THE SITE INCLUDES THE CRYOCHEM, INC. MANUFACTURING PLANT AND PROPERTY AS WELL AS THE AREA OF CONTAMINATION. THE CRYOCHEM, INC. PROPERTY IS APPROXIMATELY 19 ACRES IN SIZE AND IS SITUATED ALONG ROUTE 562 IN A SEMI-RURAL AREA OF BERKS COUNTY (FIGURE 1). THERE ARE APPROXIMATELY 100 HOMES WITHIN ONE MILE OF THE SITE.

THE SITE IS LOCATED ON GENTLY SLOPING GROUND AT THE BASE OF SAND HILL. SAND HILL IS A TOPOGRAPHICALLY HIGH AREA WITH 90 FEET OF RELIEF LOCATED IMMEDIATELY NORTHEAST OF THE SITE AND COVERED PRIMARILY WITH FORESTED WOODLAND. A SMALL STREAM, WHICH DRAINS SAND HILL, FLOWS ACROSS THE WESTERN PART OF THE SITE AND THEN THROUGH A RESIDENTIAL AREA LOCATED SOUTH OF THE CRYOCHEM PLANT. THE STREAM EVENTUALLY DISCHARGES TO IRONSTONE CREEK THAT FLOWS INTO THE MANATAWNY CREEK. SURFACE RUNOFF FROM SAND HILL IS COMBINED WITH DRAINAGE FROM THE CRYOCHEM, INC. FABRICATION BUILDING AND IS THEN CHanneled TO THE SMALL STREAM THAT RUNS ALONG THE WESTERN PART OF THE SITE.

SEVERAL FARMS AND SINGLE-FAMILY HOMES ARE LOCATED IMMEDIATELY SOUTH AND WEST OF THE CRYOCHEM, INC. MANUFACTURING PLANT (WITHIN ONE QUARTER MILE OF CRYOCHEM, INC.). THE HOMES ARE LOCATED IN EARL AND DOUGLASS TOWNSHIPS, BERKS COUNTY, PENNSYLVANIA. SEVERAL INDUSTRIES, IN ADDITION TO CRYOCHEM, INC., ARE LOCATED ALONG ROUTE 562 BOTH EAST AND WEST OF THE SITE. CRYOCHEM, INC.'S MANUFACTURING FACILITY INCLUDES A WORKSHOP AREA (FABRICATION BUILDING AND QUONSET HUT), A WAREHOUSE, AND AN OFFICE BUILDING ALL LOCATED ON THE SOUTHERN 4 ACRES OF THE CRYOCHEM, INC. PROPERTY (FIGURE 2).

ACCORDING TO AVAILABLE INFORMATION, GROUND WATER FLOWS FROM NORTHWEST TO SOUTHEAST BENEATH THE SITE AND IS CONTROLLED PREDOMINANTLY BY FRACTURES IN THE BEDROCK. GROUND WATER BENEATH THE CRYOCHEM PLANT FLOWS SOUTHEAST TOWARDS SEVERAL HOMES WHICH RELY UPON PRIVATE WELLS FOR DRINKING WATER.

#SHEA

III. SITE HISTORY AND ENFORCEMENT ACTIVITY

CRYOCHEM, INC. HAS BEEN MANUFACTURING METAL PRODUCTS, PRIMARILY PRESSURE VESSELS, AT THE SITE SINCE 1962. THE METAL FABRICATION PROCESS HISTORICALLY INCLUDED THE USE OF A SOLVENT CONTAINING TCA TO WIPE AWAY DYE USED TO CHECK FOR FAULTY WELDS. BETWEEN 1970 AND 1982, CRYOCHEM, INC. REPORTEDLY USED THE SOLVENT AT A RATE OF TWO TO THREE 55-GALLON DRUMS PER YEAR.

A SERIES OF ENVIRONMENTAL SAMPLES COLLECTED BETWEEN 1981 AND 1985 BY PADER, CRYOCHEM, INC., AND EPA HAVE REVEALED THE PRESENCE OF TCA, 1,1-DICHLOROETHANE (DCA), 1,1-DICHLOROETHENE (DCE), TRICHLOROETHENE (TCE), AND TETRACHLOROETHENE (PCE) IN AN ON-SITE PRODUCTION WELL AND IN NEARBY RESIDENTIAL WELLS. TCA, DCA, DCE, TCE, AND PCE ARE HAZARDOUS SUBSTANCES AS DEFINED IN CERCLA. THESE FIELD INVESTIGATIONS ALSO

DETECTED THE PRESENCE OF TCA IN ON-SITE SOILS.

IN MAY 1985, EPA CONDUCTED A SITE INSPECTION (SI) AT THE SITE AND COLLECTED SAMPLES FROM SOIL, GROUND WATER AND SURFACE WATER. THE RESULTS OF THE SAMPLING WOULD BE USED LATER TO DETERMINE IF THE POTENTIALLY CONTAMINATED MEDIA AT THE SITE WOULD REQUIRE CLEAN UP UNDER SUPERFUND. IN JUNE 1985, EPA RANKED AND SCORED THE SITE ACCORDING TO THE HAZARD RANKING SYSTEM (HRS). THE HRS EVALUATES HAZARDOUS SUBSTANCES (CONTAMINANTS), DEFINED IN CERCLA AND IDENTIFIED AT A SITE, THEIR MIGRATION ROUTES AND THE POTENTIAL RECEPTORS, (I.E., POPULATIONS THAT COULD BE EXPOSED TO THE CONTAMINANTS), AND THEN CALCULATES A SCORE WHICH DETERMINES THE RELATIVE HAZARD POSED BY A SITE. IF A SITE SCORES GREATER THAN 28.5 IT CAN BE RECOMMENDED FOR THE NATIONAL PRIORITIES LIST (NPL) MAKING IT ELIGIBLE TO RECEIVE FEDERAL MONEY FOR INVESTIGATION AND CLEANUP. THE CRYOCHEM SITE SCORED 28.58 AND WAS SUBSEQUENTLY PROPOSED FOR THE NPL IN JULY 1987. THE CRYOCHEM SITE WAS ADDED TO THE NPL IN OCTOBER 1989.

IN SEPTEMBER 1987, EPA SAMPLED WATER FROM RESIDENTIAL WELLS WITHIN 1/4 MILE OF THE CRYOCHEM PLANT. DUE TO THE DETECTION OF ELEVATED LEVELS OF DCE, AND OTHER COMPOUNDS, EPA'S SUPERFUND REMOVAL PROGRAM INSTALLED DUAL, ACTIVATED-CARBON FILTER UNITS IN 13 HOMES. A FILTER UNIT WAS PLACED IN EACH HOME WHERE THE REMOVAL ACTION LEVEL OF 23 UG/L (PPB) OF DCE IN DRINKING WATER WAS EXCEEDED. EPA SUBSEQUENTLY PLACED A FILTER UNIT AT AN ADDITIONAL HOME WHERE DCE LEVELS WERE ELEVATED. FIGURE 3 DEPICTS RESIDENCES WHERE EPA HAS INSTALLED A CARBON FILTER UNIT.

IN 1987, EPA MET WITH THE PRPS: CRYOCHEM, INC., C.S GARBER & SONS, INC., AND PAST OWNERS AND OPERATORS OF CRYOCHEM, INC. AND THE CRYOCHEM, INC. PROPERTY. IN FEBRUARY 1988, EPA AND PRPS FOR THE SITE ENTERED INTO A CONSENT ORDER FOR THE PRPS TO CONDUCT A RI/FS AT THE SITE. THE RI/FS WAS CONDUCTED PURSUANT TO A STATEMENT OF WORK THAT WAS ATTACHED TO THE CONSENT ORDER AND WAS COMPLETED IN JUNE 1990 UNDER THE SUPERVISION OF EPA. THE PURPOSE OF THE RI/FS WAS TO DETERMINE THE NATURE AND EXTENT OF CONTAMINATION AT THE SITE, TO ASSESS THE RISKS TO HUMAN HEALTH AND ENVIRONMENT POSED BY THE SITE, AND TO DEVELOP REMEDIAL ALTERNATIVES THAT WOULD ADDRESS THE RISKS POSED BY THE SITE. THE RI/FS ADDRESSED EACH OF THE OPERABLE UNITS.

TO SIMPLIFY AND EXPEDITE REMEDIAL ACTION AT THE SITE, EPA HAS DIVIDED THE SITE INTO THREE MANAGEABLE COMPONENTS OR OPERABLE UNITS. THE THREE OPERABLE UNITS ARE:

1. OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY;
2. OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER; AND,
3. OPERABLE UNIT 3 (OU3) - SOURCE AREA (SOIL).

EPA CONDUCTED A FOCUSED FEASIBILITY STUDY (FFS) IN THE SPRING OF 1989 FOR OU1 TO EVALUATE REMEDIAL ALTERNATIVES FOR PROVIDING AN ALTERNATE SUPPLY OF CLEAN DRINKING WATER TO HOMES AFFECTED BY THE SITE. THE FFS EVALUATED A TOTAL OF 33 HOMES AND BUSINESSES THAT ARE AFFECTED OR POTENTIALLY AFFECTED BY THE SITE. AN AFFECTED RESIDENCE HAS A WELL WITH

LEVELS OF CONTAMINANTS THAT ARE UNACCEPTABLE, E.G., LEVELS THAT EXCEED EPA'S REMOVAL ACTION LEVEL OF 23 UG/L OF DCE. A POTENTIALLY AFFECTED RESIDENCE IS LOCATED IN AN AREA THAT COULD BECOME CONTAMINATED AT UNACCEPTABLE LEVELS. A PROPOSED PLAN FOR OU1, WHICH DESCRIBED EPA'S PREFERRED ALTERNATIVE FOR SUPPLYING CLEAN DRINKING WATER, WAS RELEASED TO THE PUBLIC ON JULY 14, 1989. EPA'S PREFERRED ALTERNATIVE INCLUDED EXTENDING A WATER LINE FROM THE NEAREST PUBLIC WATER SUPPLY TO AFFECTED AND POTENTIALLY AFFECTED RESIDENTS. BASED UPON ITS REVIEW OF PUBLIC COMMENTS RECEIVED, EPA REEVALUATED THE ALTERNATIVES IN THE PROPOSED PLAN AND SELECTED A DIFFERENT ALTERNATIVE IN THE ROD FOR OU1. THE ROD FOR OU1 SELECTED INSTALLATION AND OPERATION OF A NEW WATER SUPPLY WELL TO DELIVER CLEAN DRINKING WATER TO AFFECTED AND POTENTIALLY AFFECTED RESIDENTS. THE ROD FOR OU1, WHICH SELECTED AN ALTERNATE WATER SUPPLY FOR 33 RESIDENCES AND BUSINESSES, WAS SIGNED BY EPA ON SEPTEMBER 29, 1989. EPA'S SELECTED REMEDY FOR OU1 ALSO INCLUDED INSTALLATION OF CARBON FILTER UNITS AT HOMES WHICH BECAME AFFECTED DURING THE DESIGN AND CONSTRUCTION OF A NEW WATER SUPPLY WELL AND DISTRIBUTION SYSTEM. ONCE THE NEW WELL IS COMPLETED BY EPA, EACH OF THE AFFECTED AND POTENTIALLY AFFECTED HOMES WILL THEN BE CONNECTED TO THE NEW WATER SUPPLY.

ON JULY 14, 1989, EPA SENT LETTERS TO ALL THE PRPS NOTIFYING THEM OF THEIR POTENTIAL LIABILITY FOR OU1 AND REQUESTING THEM TO IMPLEMENT THE REMEDY FOR THE CLEAN DRINKING WATER SUPPLY. ADDITIONAL LETTERS, AGAIN REQUESTING PRPS TO IMPLEMENT THE CLEAN DRINKING WATER SUPPLY REMEDY, WERE SENT TO PRPS ON NOVEMBER 17, 1989. TO DATE, THE PRPS HAVE NOT COMMITTED TO IMPLEMENTING THE CLEAN DRINKING WATER SUPPLY REMEDY. EPA IS CURRENTLY DESIGNING A NEW WATER SUPPLY SYSTEM TO DISTRIBUTE CLEAN DRINKING WATER TO AFFECTED AND POTENTIALLY AFFECTED HOMES USING SUPERFUND MONIES.

AFTER THE RI/FS WAS COMPLETED, EPA PREPARED A PROPOSED PLAN WHICH DESCRIBED THE REMEDY EPA PREFERRED TO IMPLEMENT FOR OU2 (THEN AREA WIDE GROUND WATER AND SOURCE AREA), AS WELL AS OTHER REMEDIAL ALTERNATIVES AND ASSOCIATED OPTIONS. THE REMEDY EPA PREFERRED TO IMPLEMENT INCLUDED TREATMENT OF CONTAMINATED SOIL BY SOIL VAPOR EXTRACTION AND PUMPING AND TREATING CONTAMINATED GROUND WATER BY AIR STRIPPING AND DISCHARGING TO NEARBY SURFACE WATER.

THIS ROD ADDRESSES ONLY THE REMEDIATION OF CONTAMINATED GROUND WATER SINCE EPA HAS FURTHER SEPARATED THE SITE RESPONSE ACTIONS INTO THREE OPERABLE UNITS. OU2 NOW INCLUDES GROUND WATER REMEDIATION ONLY. OU3 WILL ADDRESS THE SOURCE AREA.

#HCP

IV. HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA HAS SEVERAL PUBLIC PARTICIPATION REQUIREMENTS WHICH ARE DESCRIBED IN SECTIONS 113(K)(2)(B), 117(A), AND 121(F)(1)(G) OF CERCLA, 42 USC SECTIONS 9613(K)(2)(B), 9617(A), AND 9621(F)(1)(G).

THE PROPOSED PLAN FOR OU2 WAS RELEASED TO THE PUBLIC ON AUGUST 3, 1990.

A COPY WAS MAILED TO EACH RESIDENT NEAR THE SITE AND ALSO TO LOCAL

GOVERNMENT OFFICIALS. THE PROPOSED PLAN DEFINED A 30-DAY PERIOD DURING WHICH THE PUBLIC HAD THE OPPORTUNITY TO COMMENT ON THE PROPOSED PLAN AND THE REMEDIAL ALTERNATIVES CONSIDERED FOR OU2. THE 30-DAY PUBLIC COMMENT PERIOD PROVIDED IN THE PROPOSED PLAN STARTED AUGUST 6, 1990 AND ENDED SEPTEMBER 7, 1990.

THE RI REPORT AND THE FS WERE SENT TO THE INFORMATION REPOSITORIES, LOCATED AT THE EARL TOWNSHIP BUILDING AND THE DOUGLASS-BERKS TOWNSHIP BUILDING, IN JULY 1990. THE AVAILABILITY OF THESE DOCUMENTS WAS STATED IN THE PROPOSED PLAN.

THE ADMINISTRATIVE RECORD FILE FOR OU2 OF THE SITE WAS DELIVERED TO THE EARL TOWNSHIP BUILDING ON JULY 26, 1990. THE ADMINISTRATIVE RECORD FILE CONTAINS DOCUMENTS THAT SERVED AS THE BASIS FOR EPA'S SELECTION OF A REMEDIAL ALTERNATIVE FOR OU2 OF THE SITE.

ON AUGUST 13, 1990, EPA PUBLISHED A NOTICE OF AVAILABILITY OF THE PROPOSED PLAN AND ADMINISTRATIVE RECORD FILE IN TWO LOCAL NEWSPAPERS. THE NOTICE WAS PUBLISHED IN THE READING TIMES/EAGLE AND IN THE BOYERTOWN TIMES. SINCE THE NOTICE WAS NOT PUBLISHED UNTIL AUGUST 13, 1990, WHICH IS 7 DAYS AFTER THE START OF THE 30-DAY PUBLIC COMMENT PERIOD AS STATED IN THE PROPOSED PLAN, EPA DECIDED TO EXTEND THE PUBLIC COMMENT PERIOD THROUGH SEPTEMBER 11, 1990.

THE PUBLIC WAS ENCOURAGED TO REVIEW THE PROPOSED PLAN AND ADMINISTRATIVE RECORD FILE AND TO SUBMIT COMMENTS ON EPA'S PREFERRED REMEDIAL ALTERNATIVE. THE PUBLIC WAS GIVEN ADDITIONAL OPPORTUNITY TO COMMENT ON THE PROPOSED PLAN AND ADMINISTRATIVE RECORD FILE AT A PUBLIC MEETING HELD AT THE EARL TOWNSHIP BUILDING ON AUGUST 28, 1990. AT THIS MEETING REPRESENTATIVES FROM EPA ANSWERED QUESTIONS AND RECEIVED COMMENTS ABOUT THE SITE, THE REMEDIAL ALTERNATIVES UNDER CONSIDERATION, AND THE PROPOSED REMEDY. COMMUNITY RESPONSE TO THE THEN PREFERRED ALTERNATIVE IS SUMMARIZED WITHIN THE "COMPARATIVE ANALYSIS OF ALTERNATIVE" SECTION OF THIS ROD. A STENOGRAPHIC REPORT OF THE PUBLIC MEETING WAS PREPARED BY EPA. A RESPONSE TO COMMENTS RECEIVED DURING THE 30-DAY PUBLIC COMMENT PERIOD IS INCLUDED AS PART OF THIS ROD IN THE RESPONSIVENESS SUMMARY (APPENDIX A).

THE INDEX FOR THE ADMINISTRATIVE RECORD FILE, UPON WHICH THIS DECISION DOCUMENT IS BASED, IS CONTAINED WITHIN APPENDIX B. THIS DECISION DOCUMENT IS ALSO BASED UPON COMMENTS CONTAINED WITHIN A STENOGRAPHIC REPORT OF THE PUBLIC MEETING ON AUGUST 28, 1990 AND OTHER COMMENTS RECEIVED BY EPA DURING THE 30-DAY PUBLIC COMMENT PERIOD, WHICH ARE INCLUDED IN THE SITE FILE MAINTAINED AT EPA. THE STENOGRAPHIC REPORT AND PUBLIC COMMENTS WILL BE ADDED TO THE ADMINISTRATIVE RECORD FILE.

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V. SCOPE AND ROLE OF OPERABLE UNIT 2

AS EXPLAINED ABOVE, EPA HAS DIVIDED THE CRYOCHEM SITE INTO THREE MANAGEABLE COMPONENTS OR OPERABLE UNITS. THE THREE OPERABLE UNITS ARE:

1. OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY;

2. OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER; AND,
3. OPERABLE UNIT 3 (OU3) - SOURCE AREA (SOIL).

THIS ROD ADDRESSES OU2.

EPA HAS ALREADY SELECTED A REMEDY FOR OU1 (DRINKING WATER SUPPLY). THE CONTAMINATED DRINKING WATER IS A PRINCIPAL THREAT POSED BY THE SITE BECAUSE OF THE DIRECT INGESTION OF DRINKING WATER FROM WELLS THAT CONTAIN CONTAMINANTS ABOVE HEALTH-BASED LEVELS. THE ROD FOR OU1 PROVIDED AN ALTERNATE WATER SUPPLY FOR HOMES AFFECTED AND POTENTIALLY AFFECTED BY THE SITE. THE REMEDY FOR OU1 IS CURRENTLY IN THE REMEDIAL DESIGN STAGE.

THE RESPONSE ACTION FOR OU2 ADDRESSES GROUND WATER CONTAMINATED BY THE SITE. CONTAMINATED GROUND WATER AT THE SITE POSES A RISK TO FUTURE GROUND WATER USERS IF NOT ADDRESSED BY OU2. THE PRIMARY OBJECTIVES OF THIS RESPONSE ACTION ARE TO: 1) PREVENT FURTHER OFF-SITE MIGRATION OF CONTAMINATED GROUND WATER, 2) PREVENT MIGRATION OF CONTAMINATED GROUND WATER INTO SURFACE WATER AND INTO CURRENTLY UNAFFECTED AREAS, AND 3) RESTORE THE AQUIFER TO ITS BENEFICIAL USE, IF PRACTICABLE. THE REMEDY SELECTED IN THIS ROD ADDRESSES EACH OF THESE OBJECTIVES. THE REMEDIAL ALTERNATIVE SELECTED IN THIS ROD CAN BE ADAPTED TO BE COMPATIBLE WITH THE REMEDY SELECTED FOR OU1.

THE CONTAMINATED SOIL ON THE SITE CONTINUES TO LEACH CONTAMINANTS INTO GROUND WATER BENEATH THE SITE. THE CONTAMINATED SOIL, WHICH IS THE SOURCE OF GROUND WATER CONTAMINATION, WOULD BE ADDRESSED BY OU3. THIS THIRD OPERABLE UNIT WILL BE THE FINAL RESPONSE ACTION FOR THE SITE.

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VI. SUMMARY OF SITE CHARACTERISTICS

THE RI/FS WAS CONDUCTED TO DETERMINE THE EXTENT AND NATURE OF CONTAMINATION AT THE SITE. THE APPROXIMATE EXTENT OF GROUND WATER CONTAMINATION IS DEPICTED ON FIGURE 4. THE RESULTS OF THE RI ARE DISCUSSED IN THIS SECTION.

DURING FORMER OPERATIONS AT THE CRYOCHEM, INC. PLANT, SOLVENTS CONTAINING TCA WERE USED TO CLEAN DYE FROM METAL WELDS. THE AMOUNT OF SOLVENT REPORTEDLY USED BETWEEN 1970 AND 1982 WAS APPROXIMATELY THREE 55-GALLON DRUMS PER YEAR. CRYOCHEM, INC. ALSO REPORTED THAT A SPILL OF SOLVENT FROM A 55-GALLON DRUM OCCURRED AT SOME UNSPECIFIED TIME IN THE PAST. THE AMOUNT OF SOLVENT SPILLED IS UNKNOWN. SPILLED SOLVENT WOULD HAVE COLLECTED IN THE SHOP DRAINS AND FLOWED, THROUGH UNDERGROUND PIPES, INTO A SMALL STREAM LOCATED ALONG THE WESTERN EDGE OF THE CRYOCHEM, INC. PROPERTY.

DURING THE RI, THE SUMP INTO WHICH THE SOLVENT SPILL REPORTEDLY OCCURRED WAS EXAMINED, HYDRAULICALLY TESTED, AND DETERMINED TO BE INTACT. THE PIPES THROUGH WHICH THE SOLVENT WOULD HAVE FLOWED INTO THE ON-SITE STREAM WERE ALSO EXAMINED, HYDRAULICALLY TESTED, AND DETERMINED TO BE INTACT. THUS, IT REMAINS UNCLEAR IF THE REPORTED SPILL OF SOLVENT

CAUSED GROUND WATER CONTAMINATION AT THE SITE.

THE DESIGN SPECIFICATIONS AND CRITERIA OF ANY GROUND WATER REMEDIATION SYSTEM TO BE CONSTRUCTED AT THE SITE WOULD BE BASED, IN PART, UPON THE LOCATION OF CONTAMINATED SOIL AND THE TYPE AND AMOUNT OF CONTAMINANTS IDENTIFIED WITHIN THE SOIL. FOR EXAMPLE, THE EXTRACTION WELLS WOULD BE LOCATED TO ENSURE THAT CONTAMINANTS LEACHING FROM THE SOIL INTO GROUND WATER WOULD BE COLLECTED BY THE EXTRACTION WELLS. THUS, THE RESULTS OF THE SOIL SAMPLING ARE DISCUSSED IN THIS ROD.

DURING THE RI AND DURING PREVIOUS INVESTIGATIONS, VOCS (E.G., TCA), WERE DETECTED IN SOIL SAMPLES COLLECTED AT THE SITE. THE HIGHEST CONCENTRATIONS WERE DETECTED IN A SAMPLE COLLECTED FROM A DEPTH OF 9 TO 12 INCHES BEHIND THE FABRICATION BUILDING NEAR ITS REAR ENTRANCE (SOIL SAMPLE #17)(FIGURE 5). THE LEVELS OF CONTAMINANTS FOUND IN SOIL SAMPLE #17 ARE DEPICTED IN TABLE 1. THE ELEVATED LEVELS OF CONTAMINANTS DETECTED IN SOIL NEAR THE FABRICATION BUILDING INDICATE THAT SOLVENT DISCARDED BEHIND THE FABRICATION BUILDING MOST LIKELY CONTRIBUTED TO GROUND WATER CONTAMINATION AT THE SITE. THE ELEVATED CONCENTRATIONS OF XYLENE AND ETHYLBENZENE IN SOIL SAMPLE #17 MOST LIKELY RESULT FROM MINOR SPILLS OF FUEL DURING REFILLING OF THE FUEL TANK LOCATED NEAR THE BACK DOOR.

SOME OF THE COMPOUNDS DETECTED IN SOIL SAMPLE #17 CAN EASILY MIGRATE THROUGH THE SOIL COLUMN AND LEACH INTO THE GROUND WATER SYSTEM BENEATH THE SITE. EPA HAS CALCULATED THE AMOUNT OF CONTAMINANTS WHICH COULD REMAIN IN THE SOIL WITHOUT POSING A THREAT TO GROUND WATER. EPA'S CALCULATIONS ARE CONTAINED WITHIN ATTACHMENT 3 OF ITS MAY 22, 1990 CORRESPONDENCE WITH THE PRPS WHICH IS CONTAINED WITHIN THE ADMINISTRATIVE RECORD FILE.

THE FOLLOWING ASSUMPTIONS WERE MADE TO SIMPLIFY THE CALCULATIONS:

- * THE CONTAMINANTS THAT LEACH FROM THE SOIL TO GROUND WATER BENEATH THE SITE ARE DILUTED BY CLEAN GROUND WATER FLOWING THROUGH THE SITE;
- * THE VERTICAL INTERVAL OVER WHICH THE CONTAMINANTS ARE DILUTED IS EQUAL TO THE AVERAGE OPEN INTERVAL OF NEARBY DOMESTIC WELLS;
- * THE PRESENCE OF ORGANIC MATTER IN SOIL (ESTIMATED FROM A LITERATURE VALUE) IS THE ONLY FACTOR THAT RETARDS THE MIGRATION OF CONTAMINANTS FROM THE SOIL TO GROUND WATER SINCE VOCS TEND TO ADSORB ONTO ORGANIC MATTER; AND
- * THE RESULTING CONCENTRATION OF CONTAMINANTS IN GROUND WATER SHOULD NOT EXCEED EPA'S MOST STRINGENT ENFORCEABLE STANDARD OR AN EXCESS CANCER RISK OF 1×10^{-6} (WHICH IS FURTHER DISCUSSED IN THE NEXT SECTION OF THIS ROD).

TABLE 2 DEPICTS THE CONCENTRATION OF SPECIFIC CONTAMINANTS THAT COULD REMAIN IN THE SOIL WITHOUT PRESENTING AN UNACCEPTABLE RISK TO GROUND WATER BENEATH THE SITE. SOME OF THE CONCENTRATIONS MAY SEEM HIGH

(E.G., XYLENE) DUE TO THE FACT THAT THE CONTAMINANT IS NOT PARTICULARLY TOXIC AND ADSORBS STRONGLY TO ORGANIC MATTER IN SOIL. EPA'S CALCULATIONS INDICATE THAT THE CURRENT LEVELS OF CERTAIN CONTAMINANTS, E.G., DCA AND PCE, IN THE SOIL BEHIND THE FABRICATION BUILDING POSE A THREAT TO GROUND WATER. THE APPROXIMATE VOLUME OF CONTAMINATED SOIL BASED UPON EPA'S CALCULATIONS IS 1875 CUBIC FEET.

FIGURE 5 DEPICTS THE AREA OF CONTAMINATED SOIL AT THE SITE.

THE BEDROCK BENEATH THE SITE CONSISTS OF FRACTURED QUARTZITE (HARDYSTON FORMATION) AND CRYSTALLINE LIMESTONE (LEITHSVILLE FORMATION) OVERLAIN BY SOIL DERIVED FROM WEATHERED BEDROCK (OVERBURDEN)(FIGURES 6, 7). A FRACTURE CAN BE CONSIDERED TO BE ANY BREAK IN THE ROCK MATRIX. GROUND WATER MOVES PREDOMINANTLY THROUGH THE FRACTURE SYSTEM AND THROUGH SOLUTION CAVITIES FORMED WHEN CERTAIN MINERALS IN THE BEDROCK DISSOLVE OR WEATHER FROM THE ROCK MATRIX OVER TIME. THEREFORE, RESIDENTIAL OR OTHER WELLS PENETRATING THE SAME FRACTURES OR FRACTURE SYSTEMS CONTAINING GROUND WATER CONTAMINATED FROM THE SITE MAY THEMSELVES BECOME CONTAMINATED. SOME RESIDENTIAL WELLS ARE CONTAMINATED BY THE SAME VOCs AS THOSE FOUND IN GROUND WATER BENEATH THE SITE AND IN SOIL BEHIND CRYOCHEM INC.'S FABRICATION BUILDING.

A LARGE FAULT, WHICH IS A FRACTURE ALONG WHICH TWO SEPARATE BLOCKS OF THE BEDROCK HAVE MOVED, EXISTS SOUTH OF THE SITE (FIGURES 6, 7). THE FAULT IS SIGNIFICANT IN THAT IT SEPARATES CRYSTALLINE LIMESTONE, WHICH IS ALSO BENEATH THE SITE, FROM RED SHALE. AS GROUND WATER MOVES TOWARDS THE FAULT IT MAY MOVE UPWARD AND DISCHARGE AT THE SURFACE IN THE FORM OF SPRINGS. SIMPLIFIED, GROUND WATER DISCHARGES AS SPRINGS SINCE IT IS EASIER FOR GROUND WATER TO MOVE UP THE FAULT THAN IT IS FOR IT TO MOVE INTO THE RED SHALE.

DURING THE RI, SEVERAL GROUND WATER MONITORING WELLS WERE INSTALLED AT AND NEAR THE SITE (FIGURE 8). THE MAIN OBJECTIVE OF INSTALLING MONITORING WELLS WAS TO DETERMINE THE EXTENT OF GROUND WATER CONTAMINATION. WELLS WERE INSTALLED IN CLUSTERS, (I.E., A SHALLOW WELL WAS INSTALLED ADJACENT TO A DEEP WELL), FOR THE PURPOSE OF DETERMINING IF THE CONTAMINATION WAS CONFINED TO SHALLOW ZONES OR HAD SPREAD DEEPER INTO THE GROUND WATER SYSTEM. SINCE GROUND WATER TENDS TO MIGRATE IN DISCRETE ZONES, SUCH AS A DEEP FRACTURE, THE MONITORING WELLS WERE CONSTRUCTED TO ALLOW A SAMPLE TO BE COLLECTED FROM EITHER THE SHALLOW OR DEEP ZONE. THE SAMPLING RESULTS FROM THESE WELLS SUGGEST THAT THE CONTAMINATION IS NOT CONFINED TO SHALLOW GROUND WATER ZONES SINCE BOTH SHALLOW AND DEEP MONITORING WELLS CONTAINED CONTAMINANTS. HOWEVER, THE CONCENTRATIONS OF CONTAMINANTS IN THE SHALLOW GROUND WATER SAMPLES ARE TYPICALLY HIGHER THAN THE CONCENTRATIONS IN THE DEEPER SAMPLES SUGGESTING THAT CONTAMINANTS MAY NOT HAVE SUNK TO THE BOTTOM OF THE GROUND WATER SYSTEM. TABLE 3 DEPICTS THE HIGHEST CONCENTRATION, AT THE MOST CONTAMINATED WELL, OF THE CONTAMINANTS IDENTIFIED IN GROUND WATER MONITORING WELLS DURING THE RI. TABLE 4 DEPICTS THE 95 PERCENT UPPER CONFIDENCE LIMIT OF THE MEAN CONCENTRATION AND THE MAXIMUM CONCENTRATION OF CONTAMINANTS IDENTIFIED BY EPA IN THE MOST CONTAMINATED RESIDENTIAL WELL DOWNGRADIENT FROM THE SITE. NO VINYL CHLORIDE, WHICH IS A DEGRADATION PRODUCT OF TCE AND A KNOWN HUMAN CARCINOGEN, HAS BEEN DETECTED IN THE RESIDENTIAL WELLS.

THE RESULTS OF GROUND WATER SAMPLING DURING THE RI INDICATE THAT THE AREA OF GROUND WATER CONTAMINATION EXTENDS FROM CRYOCHEM, INC. FACILITY NEARLY 2500 FEET SOUTHEAST TO SEVERAL SPRINGS LOCATED ALONG THE TRIBUTARY TO IRONSTONE CREEK (NEAR TROUT FARM). BASED UPON THE RESULTS OF THE RI, THE PLUME OF CONTAMINATED GROUND WATER MAY EXTEND FURTHER SOUTH THAN THESE SPRINGS. HOWEVER, THE PRESENCE OF THE FAULT AND THE LARGE SPRINGS NEAR THE TROUT FARM SUGGEST THAT GROUND WATER IS DISCHARGING TO SURFACE WATER AT THIS LOCATION. TYPICALLY HIGH ELEVATION AREAS, E.G., SAND HILL OR FANCY HILL, ARE AREAS WHERE GROUND WATER IS RECHARGED BY PRECIPITATION. IN RECHARGE AREAS, GROUND WATER TYPICALLY MOVES FROM HIGH ELEVATION TO LOW ELEVATION, OR DOWNWARD. GROUND WATER EVENTUALLY MOVES TOWARDS LOW-LYING AREAS, E.G., SWAMPS AND STREAMS, AND THEN MAY MOVE UPWARD TO DISCHARGE INTO SURFACE WATER. THE PRESENCE OF SPRINGS CAN BE AN INDICATION THAT GROUND WATER IS MOVING UPWARD TO THE GROUND SURFACE.

THE LATERAL DIMENSIONS OF THE PLUME OF CONTAMINATED GROUND WATER ARE NOT FULLY DEFINED IN THE AREA SOUTHEAST OF FANCY HILL AVENUE. HOWEVER, THE RESULTS OF RESIDENTIAL WELL SAMPLING AND THE DISTRIBUTION OF CONTAMINANTS IN SURFACE WATER AND GROUND WATER NEAR THE TROUT FARM INDICATE THAT THE PLUME CONTINUES TO MOVE SOUTHEASTERLY FROM FANCY HILL AVENUE, WHERE IT IS DEFINED BY RESIDENTIAL WELL SAMPLING, TO THE SPRINGS NEAR THE TROUT FARM. FIGURE 4 DEPICTS THE APPROXIMATE EXTENT OF GROUND WATER CONTAMINATION BASED UPON THE RESULTS OF THE RI. THE VOLUME OF CONTAMINATED GROUND WATER IS ESTIMATED TO BE NEARLY 1.5 BILLION GALLONS ASSUMING A UNIFORM DEPTH OF CONTAMINATION OF 300 FEET AND MINIMAL LATERAL DISPERSION OF THE PLUME.

SINCE CONTAMINATED GROUND WATER DISCHARGES TO STREAMS ON AND NEAR THE SITE (I.E., INTO THE ON-SITE STREAM AND INTO THE STREAM NEAR THE TROUT FARM), SURFACE WATER NEAR THE SITE IS ALSO CONTAMINATED. THE LEVEL OF CONTAMINATION WITHIN THE SURFACE WATER QUICKLY DISSIPATES DOWNSTREAM FROM THE AREA WHERE CONTAMINATED GROUND WATER INTRODUCES THE CONTAMINANTS INTO THE SURFACE WATER. CONTAMINANT LEVELS IN THE SURFACE WATER ARE MOST LIKELY REDUCED BY VOLATILIZATION AND DILUTION. TABLE 5 DEPICTS THE HIGHEST CONCENTRATIONS OF CONTAMINANTS DETECTED IN SURFACE WATER AND STREAM SEDIMENT DURING THE RI. THE CONTAMINATED SURFACE WATER IS LIMITED TO THE ON-SITE STREAM AND TO THE AREA IMMEDIATELY DOWNSTREAM OF THE SPRINGS AT THE SOUTHERN EXTENT OF THE PLUME.

THE RI RESULTS ALSO SUGGEST THAT A POTENTIAL SOURCE OF GROUND WATER CONTAMINATION EXISTS SOMEWHERE NORTH OF THE CRYOCHEM, INC. PLANT. SEVERAL RESIDENTIAL WELLS LOCATED NORTH OF THE CRYOCHEM, INC. PLANT CONTAINED THE HIGHEST LEVELS OF TCE DETECTED IN THE GROUND WATER. SINCE GROUND WATER IN THE AREA GENERALLY FLOWS FROM NORTH TO SOUTH, GROUND WATER CONTAMINATED BY TCE FROM AN OFF-SITE SOURCE NORTH OF CRYOCHEM, INC. MAY HAVE MIGRATED ONTO, AND MAY CONTINUE TO MIGRATE ONTO, THE SITE. TCE WAS DETECTED AT HIGH CONCENTRATIONS IN ONLY ONE OF THE TWO ROUNDS OF SAMPLING CONDUCTED DURING THE RI/FS IN HOMES NORTH OF THE SITE.

A WETLAND AREA WAS IDENTIFIED AT THE SITE. THE WETLAND AREA IS UPSTREAM OF THE AREA WHICH HAS BEEN IDENTIFIED AS THE SOURCE OF THE SITE-RELATED GROUND WATER AND SURFACE WATER CONTAMINATION AND THEREFORE IS MOST LIKELY NOT IMPACTED BY THE SITE-RELATED CONTAMINATION. ONE OBLIGATE

WETLAND SPECIES, THE COMMON CATTAIL, WAS IDENTIFIED IN THE WETLAND AREA. NO OTHER WETLAND AREAS, EXCEPT THE STREAM ITSELF, WERE IDENTIFIED.

NO FEDERALLY LISTED OR PROPOSED ENDANGERED OR THREATENED SPECIES ARE KNOWN TO OCCUR ON OR NEAR THE SITE. NO ENDANGERED OR THREATENED SPECIES LISTED BY THE COMMONWEALTH OF PENNSYLVANIA ARE KNOWN TO EXIST ON OR IN THE VICINITY OF THE SITE, BUT ONE STATE ENDANGERED SPECIES, THE BOG TURTLE, MAY EXIST ON OR NEAR THE SITE. NO STRUCTURES LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES EXIST WITHIN EARL TOWNSHIP, BERKS COUNTY, PENNSYLVANIA. THE IRONSTONE BRIDGE, WHICH CROSSES THE IRONSTONE CREEK AT FARMINGTON AVENUE IN DOUGLASS TOWNSHIP, BERKS COUNTY, PENNSYLVANIA, IS LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES, BUT IS NOT LOCATED NEAR THE SITE AND WOULD NOT BE IMPACTED BY THE ALTERNATIVES CONSIDERED FOR REMEDIATION OF THE SITE.

APPENDIX C CONTAINS A SUMMARY OF ALL SAMPLING DATA COLLECTED DURING THE RI/FS.

#SSR

VII. SUMMARY OF SITE RISKS

DURING THE RI/FS, A BASELINE RISK ASSESSMENT WAS CONDUCTED THAT QUANTIFIED THE RISKS POSED BY THE SITE IF NO RESPONSE ACTIONS WERE TAKEN TO ADDRESS SITE-RELATED CONTAMINATION. BOTH EPA AND JACA CORPORATION (ON BEHALF OF THE PRPS) CONDUCTED A BASELINE RISK ASSESSMENT. EPA CONDUCTED ITS OWN RISK ASSESSMENT TO 1) DOUBLE CHECK CALCULATIONS PERFORMED BY PRPS, 2) MAKE USE OF ADDITIONAL DATA COLLECTED BY EPA FROM CARBON FILTER UNITS, 3) EVALUATE EXPOSURE PATHWAYS WHICH WERE NOT EVALUATED BY THE PRPS, AND FOLLOW NEW EPA GUIDANCE. EPA'S RISK ASSESSMENT FOLLOWED RECENT EPA GUIDANCE ON CONDUCTING RISK ASSESSMENTS (RISK ASSESSMENT GUIDANCE FOR SUPERFUND, VOLUME 1 HUMAN HEALTH EVALUATION MANUAL, DECEMBER, 1989). THE FOCUS OF EACH RISK ASSESSMENT WAS TO DETERMINE HUMAN HEALTH EFFECTS THAT COULD RESULT FROM EXPOSURE TO THE CONTAMINANTS OF CONCERN ASSOCIATED WITH THE SITE. JACA'S RESULTS ARE CONSISTENT WITH EPA'S RESULTS WHEN SIMILAR EXPOSURE PATHWAYS WERE EVALUATED.

DURING THE RI, CONTAMINANTS WERE DETECTED IN SOIL, GROUND WATER, SURFACE WATER, AND SEDIMENTS NEAR THE SITE. CONTAMINANTS OF CONCERN ARE THOSE THAT 1) PRESENT A POTENTIAL RISK TO HUMAN HEALTH AND THE ENVIRONMENT AT THE DETECTED CONCENTRATIONS, 2) ORIGINATED FROM THE SITE, AND 3) WERE ABOVE BACKGROUND LEVELS. A CONTAMINANT PRESENTS A POTENTIAL RISK TO HUMAN HEALTH IF ITS CONCENTRATION EXCEEDS THE $1 \times (10^{-6})$ EXCESS CANCER RISK LEVEL FOR CANCER-CAUSING COMPOUNDS OR THE MAXIMUM SAFE DOSE FOR NON-CANCER EFFECTS. IN OTHER WORDS, THERE IS 1 EXTRA CHANCE OUT OF 1,000,000 (ONE MILLION) OF CONTRACTING CANCER DUE TO A LIFETIME OF EXPOSURE TO A CARCINOGENIC COMPOUND IN A CONCENTRATION EQUAL TO THE $1 \times (10^{-6})$ LEVEL. THIS RISK IS IN ADDITION TO THE RISK POSED BY ALL OTHER SOURCES, E.G., A 30,000 CHANCE OUT OF 1,000,000 OF CONTRACTING CANCER FROM SMOKING. THE NCP STATES THAT AN ACCEPTABLE RISK RANGE IS BETWEEN $1 \times (10^{-4})$ (1 IN 10,000 OR 100 IN 1,000,000) AND $1 \times (10^{-6})$ (1 IN 1,000,000). HOWEVER, EPA STRIVES TO REDUCE RISK TO THE $1 \times (10^{-6})$ LEVEL AND THUS USES THIS LEVEL AS THE POINT OF DEPARTURE. THE

CONTAMINANTS OF CONCERN AND THE AFFECTED MEDIA AT THE SITE ARE IDENTIFIED IN TABLE 6.

AN INDIVIDUAL MAY BE EXPOSED TO CONTAMINANTS OF CONCERN VIA SEVERAL DIFFERENT EXPOSURE PATHWAYS. TABLE 7 IDENTIFIES THE EXPOSURE PATHWAYS ASSOCIATED WITH THE AFFECTED MEDIA IDENTIFIED ABOVE.

THE ASSESSMENT OF RISK INVOLVES MANY ASSUMPTIONS ABOUT THE AMOUNT OF EXPOSURE TO CONTAMINANTS. EPA STRIVES TO SELECT PROTECTIVE REMEDIES AND THUS UTILIZES RISK ESTIMATING ASSUMPTIONS THAT ARE SOMEWHAT CONSERVATIVE, E.G., EPA USES THE UPPER BOUND ESTIMATES OF THE MEAN VALUES OF CERTAIN PARAMETERS (95TH PERCENTILE CONCENTRATION). FOR EXAMPLE, EPA ASSUMES THAT AN INDIVIDUAL LIVES AT THE SAME RESIDENCE FOR 30 YEARS. TABLE 8 LISTS EACH OF THE ASSUMPTIONS EPA USED TO CALCULATE EXPOSURE TO CONTAMINANTS OF CONCERN AT THE SITE. THE EXPOSURE SCENARIO, WHICH IS DEVELOPED USING THE ASSUMPTIONS IDENTIFIED BELOW, IS A REASONABLE MAXIMUM EXPOSURE SCENARIO.

CHEMICAL INTAKES ARE CALCULATED BY COMBINING THE AMOUNT OF CHEMICAL (EACH CONTAMINANT OF CONCERN) WITH THE DURATION OF THE EXPOSURE TO THE CONTAMINATED ENVIRONMENTAL MEDIA.

CURRENT AND POTENTIAL FUTURE EXPOSURE SCENARIOS WERE EVALUATED IN THE RISK ASSESSMENT. SINCE RESIDENTIAL WELLS THAT ARE AFFECTED ARE EQUIPPED WITH CARBON FILTERS, INGESTION OF CONTAMINATED GROUND WATER WAS CONSIDERED TO BE A POTENTIAL FUTURE EXPOSURE. FOR EXAMPLE, AN INDIVIDUAL COULD BE EXPOSED IF A NEW WELL WAS DRILLED INTO THE CONTAMINATED AREA OR IF THE EXISTING FILTER UNITS WERE NOT PROPERLY MAINTAINED. THUS, THE ESTIMATES ARE BASED UPON LEVELS OF CONTAMINANTS IN UNTREATED WATER. FUTURE USE SCENARIOS ALSO ASSUME THAT CURRENT EXPOSURES CONTINUE INTO THE FUTURE, I.E., NO REMEDIATION OCCURS. CURRENT EXPOSURE SCENARIOS INCLUDE INCIDENTAL INGESTION OF SURFACE WATER WHILE PLAYING IN THE CONTAMINATED STREAM, DERMAL (SKIN) CONTACT WITH SURFACE WATER WHILE PLAYING IN THE STREAM, INCIDENTAL INGESTION OF SOIL BY A CHILD WHO TRESPASSES BEHIND CRYOCHEM, INC.'S FABRICATION BUILDING, AND INGESTION OF FISH CAUGHT IN THE CONTAMINATED STREAM. DERMAL CONTACT WITH CONTAMINATED SOIL BY CRYOCHEM, INC. WORKERS AND INHALATION OF CONTAMINANTS FROM SOIL BY CRYOCHEM, INC. WORKERS ARE POTENTIAL EXPOSURE PATHWAYS, BUT WERE NOT EVALUATED BY EPA SINCE THE EXPOSURE IS EXPECTED TO BE MINIMAL, I.E., LESS THAN 1×10^{-6} . JACA EVALUATED EXPOSURE TO CRYOCHEM, INC. WORKERS AND DETERMINED THAT EXPOSURES FROM CONTAMINATED SOIL WERE WELL BELOW (SAFER THAN) ACCEPTABLE RISK-BASED LEVELS. THE RISKS RESULTING FROM EXPOSURE TO CONTAMINATED SOIL WILL BE ADDRESSED IN OU3.

CANCER POTENCY FACTORS (CPFS) HAVE BEEN DEVELOPED BY EPA'S CARCINOGENIC ASSESSMENT GROUP FOR ESTIMATING EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC (CANCER-CAUSING) CHEMICALS. CPFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)⁽⁻¹⁾, ARE MULTIPLIED BY THE ESTIMATED CHEMICAL INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG-DAY, TO PROVIDE AN UPPERBOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH THE EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPER BOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF. USE OF THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL

CANCER RISK HIGHLY UNLIKELY. CPFS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED. CPFS FOR THE CONTAMINANTS OF CONCERN ARE DEPICTED IN TABLE 9.

REFERENCE DOSES (RFDs) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM EXPOSURE TO CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS. RFDs, WHICH ARE EXPRESSED IN UNITS OF MG/KG-DAY, ARE ESTIMATES OF LIFETIME DAILY EXPOSURE LEVELS FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS. ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA (E.G., THE AMOUNT OF CHEMICAL INGESTED FROM CONTAMINATED DRINKING WATER) CAN BE COMPARED TO THE RFD. RFDs ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL STUDIES OR ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED (E.G., TO ACCOUNT FOR THE USE OF ANIMAL DATA TO PREDICT EFFECTS ON HUMANS). THESE UNCERTAINTY FACTORS HELP TO ENSURE THAT THE RFDs WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR. RFDs FOR THE CONTAMINANTS OF CONCERN ARE DEPICTED IN TABLE 9.

EXCESS LIFETIME CANCER RISKS ARE DETERMINED BY MULTIPLYING THE INTAKE LEVEL WITH THE CPF. THESE RISKS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., $1 \times (10^{-6})$, OR 1 MILLION). AN EXCESS LIFETIME CANCER RISK OF $1 \times (10^{-6})$ INDICATES THAT, AS A PLAUSIBLE UPPER BOUND, AN INDIVIDUAL HAS A ONE IN ONE MILLION CHANCE OF DEVELOPING CANCER AS A RESULT OF SITE-RELATED EXPOSURE TO A CARCINOGEN OVER HIS OR HER ENTIRE LIFETIME. EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH SITE-RELATED EXPOSURES ARE DEPICTED IN TABLES 10-12.

POTENTIAL CONCERN FOR NONCARCINOGENIC EFFECTS OF A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS A HAZARD QUOTIENT (OR THE RATIO OF THE ESTIMATED INTAKE DERIVED FROM THE CONTAMINANT CONCENTRATION IN A GIVEN MEDIUM TO THE RFD FOR THE CONTAMINANT). BY ADDING THE HAZARD QUOTIENT FOR ALL CONTAMINANTS WITHIN A MEDIUM OR ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE MEDIUM OR ACROSS ALL MEDIA. THE HIS ASSOCIATED WITH SITE-RELATED EXPOSURES ARE DEPICTED IN TABLE 13-15.

BECAUSE RECEPTOR POPULATIONS COULD REASONABLY BE EXPOSED BY ALL THE EXPOSURE ROUTES EVALUATED, RISKS AND HAZARD INDEXES FROM EACH EXPOSURE ROUTE WERE COMBINED IN TABLES 12 AND 15. SINCE EXPOSURE TO MORE THAN ONE CHEMICAL COULD OCCUR THROUGH ANY OF THE EXPOSURE PATHWAYS, CARCINOGENIC RISKS AND HAZARDS FOR EACH CHEMICAL WERE ADDED TO OBTAIN THE TOTAL RISK OR HAZARD INDEX FOR ANY PARTICULAR EXPOSURE PATHWAY. CANCER RISKS TO CHILDREN AND ADULTS WERE ALSO COMBINED UNDER THE ASSUMPTION THAT CHILDREN RAISED NEAR THE SITE MIGHT CONTINUE TO LIVE THERE AS ADULTS. HAZARD INDEXES FOR CHILDREN AND ADULTS WERE NOT COMBINED BECAUSE THEY WERE BASED ON 1-YEAR, RATHER THAN LIFETIME, EXPOSURES.

THE TOTAL UPPER BOUND EXCESS LIFETIME CANCER RISK ASSOCIATED WITH THE FUTURE USE SCENARIO INCLUDING ALL CURRENT USE EXPOSURES WAS $1.23 \times (10^{-2})$ OR APPROXIMATELY 1 IN 100. THIS MEANS THAT FOR EVERY

1,000,000 PEOPLE EXPOSED TO SITE-RELATED CONTAMINANTS, APPROXIMATELY 10,000 COULD CONTRACT CANCER DUE TO THEIR EXPOSURE. THERE ARE SEVERAL IMPORTANT CAVEATS TO THIS ESTIMATE:

1. NEARLY ALL THE RISK WAS ASSOCIATED WITH RESIDENTIAL WELL WATER, WHICH IS CURRENTLY BEING TREATED WITH CARBON FILTER UNITS. THEREFORE THIS EXPOSURE IS NOT PRESENTLY OCCURRING.
2. MOST OF THE RESIDENTIAL WELL RISK WAS ASSOCIATED WITH DCE WHICH IS A CLASS C CARCINOGEN. THIS CLASSIFICATION MEANS THAT ANIMAL TUMOR DATA FOR THIS COMPOUND ARE EQUIVOCAL. IT IS POSSIBLE THAT DCE IS NOT CARCINOGENIC IN HUMANS.
3. THE RISK ESTIMATE APPLIES ONLY TO THE MOST CONTAMINATED HOMES. CANCER RISKS AT THE OTHER HOMES WOULD PROBABLY BE LESS.

THE TOTAL HI ASSOCIATED WITH THE FUTURE USE SCENARIO WAS 1.47 FOR ADULTS AND 6.00 FOR CHILDREN. THIS RISK ORIGINATED ALMOST ENTIRELY FROM WELL WATER. THE HI FOR INHALATION MAY BE ARTIFICIALLY LOW SINCE INHALATION RFDS WERE NOT AVAILABLE FOR FOUR OF THE COMPOUNDS.

THE FOLLOWING FACTORS CONTRIBUTED ELEMENTS OF UNCERTAINTY IN THE RISK ASSESSMENT: 1) THE ACTUAL OR POTENTIAL USE OF THE CONTAMINATED STREAM FOR RECREATION, 2) LIMITED SAMPLE DATABASE FOR SOME MEDIA (E.G., SURFACE WATER), 3) CARCINOGENIC CONTAMINANTS AT THE SITE HAVE BEEN FOUND TO CAUSE CANCER IN ANIMALS ONLY, 4) CPFS WERE EXTRAPOLATED FROM HIGH DOSES GIVEN TO ANIMALS TO LOW DOSES RECEIVED FROM ENVIRONMENTAL EXPOSURES, 5) CARCINOGENIC POTENCY WAS EXTRAPOLATED FROM ANIMALS TO HUMANS ON THE BASIS OF DOSE PER SURFACE AREA, 6) NON-CANCER EFFECTS WERE EXTRAPOLATED FROM ANIMALS TO HUMANS BY A SET OF PROTECTIVE 10-FOLD UNCERTAINTY FACTORS, AND 7) DATA ON SYNERGISM OR ANTAGONISM AMONG THE CONTAMINANTS WERE NOT AVAILABLE. HOWEVER, THE MAJORITY OF THE RISK POSED BY THE SITE RESULTED FROM CONTAMINATED GROUND WATER WHICH HAS AN EXTENSIVE DATABASE OF HIGH QUALITY SAMPLES, I.E., SAMPLES WHICH PASSED A THOROUGH QUALITY ASSURANCE/QUALITY CONTROL REVIEW.

#DSC

VIII. DOCUMENTATION OF SIGNIFICANT CHANGES

THE PROPOSED PLAN FOR OU2 CONTAINED 4 GROUND WATER TREATMENT AND DISCHARGE ALTERNATIVES WHICH WERE DETAILED IN SUBCATEGORIES UNDER TWO DIFFERENT GENERAL ALTERNATIVES. THE 4 GROUND WATER TREATMENT AND DISCHARGE ALTERNATIVES WERE IDENTIFIED UNDER SUBCATEGORIES "A", "B", "C", AND "D". THESE 4 ALTERNATIVES WERE GROUPED UNDER GENERAL ALTERNATIVE 2 (I.E., 2A, 2B, 2C, AND 2D) AND GENERAL ALTERNATIVE 3 (I.E., 3A, 3B, 3C, AND 3D). ALTERNATIVES 2A THROUGH 2D AND ALTERNATIVES 3A THROUGH 3D RESPECTIVELY CONTAIN THE SAME GROUND WATER COMPONENTS. ALTERNATIVES 3A THROUGH 3D ALSO INCLUDED A SOIL REMEDIATION COMPONENT. OTHER THAN THE INCLUSION OF SOIL VAPOR EXTRACTION IN ALTERNATIVES 3A THROUGH 3D, THE SUBCATEGORIES UNDER "GENERAL" ALTERNATIVE 2 AND "GENERAL" ALTERNATIVE 3 WERE THE SAME. FOR EXAMPLE, THE GROUND WATER

COMPONENTS OF ALTERNATIVE 3A WERE THE SAME AS THE GROUND WATER COMPONENTS OF ALTERNATIVE 2A.

THE PROPOSED PLAN WAS SENT TO THE TWO LOCAL INFORMATION REPOSITORIES AND RESIDENTS NEAR THE SITE ON AUGUST 3, 1990. IN ADDITION, A MINIMUM 30-DAY COMMENT PERIOD WAS CONDUCTED FROM AUGUST 3, 1990 TO SEPTEMBER 11, 1990, AND A PUBLIC MEETING WAS HELD AUGUST 28, 1990 TO PROVIDE THE PUBLIC WITH AN OPPORTUNITY TO COMMENT ON THE REMEDIAL ALTERNATIVES FOR OU2. THE PUBLIC COMMENT PERIOD WAS SUBSEQUENTLY EXTENDED TO SEPTEMBER 17, 1990 SINCE THE NOTICE OF AVAILABILITY OF THE PROPOSED PLAN WAS NOT PUBLISHED IN LOCAL NEWSPAPERS UNTIL AUGUST 13, 1990.

AFTER EPA ISSUED THE PROPOSED PLAN, WHICH DESCRIBED THE RESPONSE ACTION EPA PREFERRED TO IMPLEMENT FOR OU2, AND UPON REVIEW OF ADDITIONAL INFORMATION WHICH BECAME AVAILABLE TO EPA DURING THE 30-DAY PUBLIC COMMENT PERIOD FOR OU2, EPA DETERMINED THAT ADDITIONAL ALTERNATIVES TO REMEDIATE CONTAMINATED SOIL AT THE SITE SHOULD BE DEVELOPED AND THE PUBLIC SHOULD BE PROVIDED THE OPPORTUNITY TO REVIEW AND COMMENT ON THESE REMEDIAL ALTERNATIVES. THUS, EPA HAS DECIDED TO FURTHER SEPARATE RESPONSE ACTIVITIES AT THE SITE INTO THREE OPERABLE UNITS. THE THIRD OPERABLE UNIT (OU3) WILL CONSIST ONLY OF THE "SOURCE AREA" (SOIL) COMPONENT OF OU2 DESCRIBED IN THE PROPOSED PLAN FOR OU2.

SINCE SOIL CONTAMINATION WILL NOW BE ADDRESSED AS A THIRD OPERABLE UNIT, ONLY ALTERNATIVES 2A THROUGH 2D, AS DESCRIBED IN THE PROPOSED PLAN FOR OU2, ARE CONSIDERED IN THIS ROD. BECAUSE THIS ROD ADDRESSES GROUND WATER, AND THE GROUND WATER COMPONENTS OF THE ALTERNATIVES IDENTIFIED IN THE PROPOSED PLAN ARE UNAFFECTED BY EXCLUSION OF A SOIL TREATMENT TECHNOLOGY, EPA HAS DECIDED TO ELIMINATE CONSIDERATION OF ALTERNATIVES 3A THROUGH 3D IN THIS ROD.

#ALT

IX. ALTERNATIVES

THIS SECTION OF THE ROD DESCRIBES THE PROCESS OF SCREENING AND DEVELOPING REMEDIAL ALTERNATIVES AND DISCUSSES IN DETAIL EACH OF THE GROUND WATER REMEDIATION ALTERNATIVES EVALUATED IN THE PROPOSED PLAN. REMEDIAL ALTERNATIVES WERE DEVELOPED TO MEET THE REMEDIAL OBJECTIVES OF THIS RESPONSE ACTION. THE REMEDIAL OBJECTIVES ARE IDENTIFIED IN TABLE 16.

THE COMMONWEALTH OF PENNSYLVANIA REQUIRES THAT GROUND WATER BE REMEDIATED TO "BACKGROUND" QUALITY AS SPECIFIED BY 25 PA CODE SECTIONS 264.90 THROUGH 264.100. THE COMMONWEALTH OF PENNSYLVANIA ALSO MAINTAINS THAT THE REQUIREMENT TO REMEDIATE TO BACKGROUND IS FOUND IN OTHER LEGAL AUTHORITIES.

IN ORDER TO RESTORE THE AQUIFER TO ITS BENEFICIAL USE, THE REMEDIATION SYSTEM IMPLEMENTED IN EACH OF THE ALTERNATIVES WOULD OPERATE UNTIL SITE-SPECIFIC REMEDIATION GOALS ARE ACHIEVED. THUS THE AQUIFER WOULD BE REMEDIATED UNTIL THE CONTAMINATE LEVELS REACH THE MCLS, NON-ZERO MCLGS, OR BACKGROUND, WHICHEVER ARE LOWER.

IF IMPLEMENTATION OF THE SELECTED REMEDY DEMONSTRATES, IN CORROBORATION WITH HYDROGEOLOGICAL AND CHEMICAL EVIDENCE THAT IT WILL BE TECHNICALLY IMPRACTICABLE TO ACHIEVE AND MAINTAIN THE REMEDIATION GOALS THROUGHOUT THE AREA OF ATTAINMENT, THE USEPA IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO AMEND THE ROD OR ISSUE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO INFORM THE PUBLIC OF ALTERNATIVE GROUNDWATER GOALS.

SCREENING OF ALTERNATIVES

TABLE 17 IDENTIFIES EACH OF THE REMEDIAL TECHNOLOGIES AND MANAGEMENT OR PROCESS OPTIONS WHICH WERE SCREENED IN THE FS AND CONSIDERED IN THE DEVELOPMENT OF REMEDIAL ALTERNATIVES FOR CONTAMINATED GROUND WATER. THE SIGNIFICANCE OF THE SCREENING EXERCISE IS TO DETERMINE WHICH TECHNOLOGIES AND OPTIONS CAN BEST SATISFY THE REMEDIAL OBJECTIVES. EACH OF THE TECHNOLOGIES AND OPTIONS ARE EVALUATED ON THE BASIS OF THEIR EFFECTIVENESS AND THEIR ABILITY TO BE IMPLEMENTED CONSIDERING SITE-SPECIFIC CONDITIONS. ONLY THOSE MEASURES THAT COULD CONCEIVABLY MEET THE REMEDIAL ACTION OBJECTIVES, OR THE MAJORITY OF THEM, WERE FURTHER DEVELOPED INTO REMEDIAL ALTERNATIVES. REMEDIAL ACTION ALTERNATIVES ARE FURTHER LIMITED TO PROVEN AND/OR INNOVATIVE TECHNOLOGIES AND PROCESS OPTIONS THAT HAVE BEEN USED SUCCESSFULLY AT OTHER SITES.

DESCRIPTION OF ALTERNATIVES

BASED UPON THE SCREENING AND EVALUATION OF POTENTIALLY APPLICABLE REMEDIAL TECHNOLOGIES AND MANAGEMENT OR PROCESS OPTIONS AND THE REQUIREMENT WITHIN THE NCP (SEE 40 CFR SECTION 300.430(E)(6)) TO EVALUATE A "NO ACTION" ALTERNATIVE AND/OR A "NO FURTHER ACTION" ALTERNATIVE, THE FOLLOWING REMEDIAL ACTION ALTERNATIVES HAVE BEEN SELECTED FOR FURTHER DEVELOPMENT AND DETAILED EVALUATION:

1. NO ACTION
2. GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE
 - A. TREATMENT BY AIR STRIPPING, DISCHARGE TO RECHARGE WELLS
 - B. TREATMENT BY CARBON ADSORPTION, DISCHARGE TO RECHARGE WELLS
 - C. TREATMENT BY AIR STRIPPING, DISCHARGE TO SURFACE WATER
 - D. TREATMENT BY CARBON ADSORPTION, DISCHARGE TO SURFACE WATER

THE FS, WHICH WAS PREPARED BY JACA CORPORATION ON BEHALF OF THE PRPS, DEVELOPED ALTERNATIVES THAT COMBINE TREATMENT OF GROUND WATER WITH PROVISION OF CLEAN DRINKING WATER TO RESIDENTS. IN THE ROD FOR OU1, EPA HAS ALREADY EVALUATED ALTERNATIVES TO PROVIDE DRINKING WATER TO RESIDENTS. THOSE DRINKING WATER PORTIONS OF THE ALTERNATIVES WILL NOT BE DISCUSSED AGAIN HERE. ONLY THOSE ALTERNATIVES IN THE FS THAT ARE APPLICABLE TO OU2 WILL BE DETAILED IN THIS ROD. THUS, THE ALTERNATIVES DETAILED BELOW ARE NOT IDENTICAL TO THE ALTERNATIVES IDENTIFIED IN THE FS, BUT THEY INCLUDE THE SAME TECHNOLOGIES AND PROCESS OPTIONS AS EVALUATED IN THE FS. EACH ALTERNATIVE CONSIDERED FOR OU2 IS DETAILED BELOW. ALTERNATIVES 2A THROUGH 2D ARE SIMILAR, BUT RELY UPON DIFFERENT COMBINATIONS OF TECHNOLOGIES AND PROCESS OPTIONS.

ALTERNATIVE 1 - NO ACTION

CAPITAL COST:	N/A
ANNUAL O&M:	\$ 14,000
PRESENT WORTH:	\$ 423,000
IMPLEMENTATION:	N/A

THE NCP REQUIRES THAT EPA CONSIDER A "NO ACTION" ALTERNATIVE FOR EACH SITE (40 CFR SECTION 300.430(E)(6)). THIS ALTERNATIVE PROVIDES ONLY FOR SAMPLING AND PERIODIC REVIEWS TO MONITOR THE MOVEMENT OF THE PLUME OF CONTAMINATED GROUND WATER. THIS ALTERNATIVE DOES NOT PROVIDE FOR GROUND WATER REMEDIATION NOR DOES IT REDUCE THE FURTHER SPREAD OF CONTAMINATION FROM THE SITE. THE FUTURE RISKS POSED BY THE SITE WOULD NOT BE REDUCED, EXCEPT BY NATURAL PROCESSES, AND THE REMEDIAL OBJECTIVES WOULD NOT BE MET. THIS ALTERNATIVE SERVES ONLY AS A BASELINE AGAINST WHICH THE OTHER ALTERNATIVES SHOULD BE COMPARED.

ACCORDING TO THE RISK ASSESSMENT, THE EXCESS CANCER RISK TO POTENTIAL FUTURE GROUND WATER USERS IS IN THE RANGE OF (10⁻³) WHICH MEANS THAT BETWEEN 1,000 AND 9,999 PEOPLE OUT OF 1,000,000 PEOPLE DRINKING CONTAMINATED WATER, AT EXPOSURE LEVELS DISCUSSED ABOVE, COULD CONTRACT CANCER. THUS, NEITHER THE "NO ACTION" ALTERNATIVE NOR THE "NO FURTHER ACTION" ALTERNATIVE PROVIDE ACCEPTABLE PROTECTION FROM CANCER RISKS POSED BY THE SITE.

ALTERNATIVE 2 - GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE

UNDER THIS GENERAL ALTERNATIVE, TWO TREATMENT TECHNOLOGIES AND TWO PROCESS (DISCHARGE) OPTIONS ARE CONSIDERED. THE TREATMENT TECHNOLOGIES ARE AIR STRIPPING AND CARBON ADSORPTION. THE DISCHARGE OPTIONS ARE DISCHARGE TO SURFACE WATER OR REINJECTION INTO THE AQUIFER THROUGH RECHARGE WELLS. THE VARIOUS TECHNOLOGIES AND OPTIONS ARE DEVELOPED INTO FOUR SEPARATE ALTERNATIVES. THE FOUR ALTERNATIVES ARE:

ALTERNATIVE 2A - TREATMENT BY AIR STRIPPING, DISCHARGE TO AQUIFER
RECHARGE WELLS

ALTERNATIVE 2B - TREATMENT BY CARBON ADSORPTION, DISCHARGE TO AQUIFER
RECHARGE WELLS

ALTERNATIVE 2C - TREATMENT BY AIR STRIPPING, DISCHARGE TO SURFACE WATER

ALTERNATIVE 2D - TREATMENT BY CARBON ADSORPTION, DISCHARGE TO SURFACE
WATER

ALTERNATIVES 2A THROUGH 2D HAVE MANY COMMON COMPONENTS. THE COMMON COMPONENTS ARE 1) GROUND WATER REMEDIAL DESIGN STUDY; 2) GROUND WATER EXTRACTION; AND; 3) PERIODIC MONITORING. THESE COMMON COMPONENTS WILL BE DISCUSSED BEFORE INDIVIDUAL ALTERNATIVES ARE DESCRIBED.
GROUND WATER REMEDIAL DESIGN STUDY

A GROUND WATER REMEDIAL DESIGN STUDY MUST BE COMPLETED BEFORE A GROUND WATER REMEDY CAN BE FULLY DESIGNED. UNTIL EPA HAS MORE INFORMATION ON THE DEPTH OF THE CONTAMINANTS THROUGHOUT THE PLUME AREA AND THE AQUIFER

CHARACTERISTICS THROUGHOUT THE PLUME AREA, IT IS DIFFICULT TO DETERMINE THE CONSTRUCTION SPECIFICS OF GROUND WATER EXTRACTION WELLS AND THE NUMBER OF EXTRACTION WELLS NEEDED TO MEET THE REMEDIAL OBJECTIVES AND CLEAN UP GOALS. IN ADDITION, THE EXISTENCE OF TCE IN GROUND WATER UPGRADIENT TO THE CRYOCHEM, INC. PLANT AND ITS POTENTIAL EFFECTS UPON THE RESPONSE ACTION IN THIS ROD, SHOULD BE EVALUATED. THEREFORE, A GROUND WATER REMEDIAL DESIGN STUDY WOULD BE THE FIRST COMPONENT OF EACH OF THE REMEDIAL ALTERNATIVES UNDER CONSIDERATION. IN ORDER TO DEVELOP COSTS TO ADEQUATELY COMPARE ALTERNATIVES, THE FS ASSUMED THE NEED FOR THIRTEEN (13), 300-FOOT DEEP EXTRACTION WELLS. EACH ALTERNATIVE ALSO INCLUDES TWO (2) 5,000 GALLON STORAGE TANKS AND NEARLY 5,000 FEET OF COLLECTION PIPING WHICH WOULD DELIVER WATER TO TWO (2) CENTRALLY LOCATED TREATMENT PLANTS.

GROUND WATER EXTRACTION

ALTERNATIVES 2A THROUGH 2D EACH INVOLVE PUMPING CONTAMINATED GROUND WATER FROM BENEATH THE CRYOCHEM, INC. PLANT AND FROM THE DOWNGRADIENT AREA OF THE PLUME TO PREVENT FURTHER MIGRATION OF THE PLUME FROM BENEATH THE CRYOCHEM, INC. PLANT AND INTO CURRENTLY UNAFFECTED AREAS. THE PLUME OF CONTAMINATION CURRENTLY EXTENDS FROM THE SITE TO SEVERAL SPRINGS NEAR THE TROUT FARM. THE PLUME IS APPROXIMATELY 2500 FEET LONG AND 600 FEET WIDE AND INCLUDES UP TO 1.5 BILLION GALLONS OF WATER (ASSUMING A UNIFORM DEPTH OF CONTAMINATION OF 300 FEET). SINCE THE AQUIFER IS A CLASS IIA AQUIFER, WHICH MEANS THAT THE AQUIFER IS CURRENTLY A DRINKING WATER AQUIFER, EPA'S CLEANUP GOALS WOULD INCLUDE RESTORATION OF THE AQUIFER TO ITS BENEFICIAL USE, IF PRACTICABLE.

EACH ALTERNATIVE WOULD RELY IN WHOLE OR IN PART UPON NATURAL RECHARGE OF CLEAN WATER (PRECIPITATION AND UPGRADIENT GROUND WATER) INTO THE AREA OF ATTAINMENT, I.E., THE PLUME OR THE AREA IN WHICH THE CLEANUP GOALS WOULD BE MET. SINCE AN APPARENT SOURCE OF TCE WAS IDENTIFIED UPGRADIENT TO THE SITE DURING THE RI, THE CLEANUP GOAL FOR TCE MAY NOT BE ACHIEVED UNTIL THE UPGRADIENT SOURCE IS ADDRESSED. THE UPGRADIENT SOURCE OF TCE WILL BE EVALUATED FURTHER DURING THE GROUND WATER REMEDIAL DESIGN STUDY.

IT MAY NOT BE PRACTICAL, OR POSSIBLE, TO PRECISELY DEFINE THE AREA OF ATTAINMENT OR THE AREA OF GROUND WATER ABOVE MCLS OR BACKGROUND WITHOUT FIRST MAKING SOME ASSUMPTIONS, SUCH AS MINIMAL LATERAL DISPERSION OF THE PLUME. AN EXTRAORDINARY NUMBER OF MONITORING WELLS WOULD NEED TO BE INSTALLED TO PRECISELY DEFINE THE PLUME. THEREFORE, ALTHOUGH THE PLUME IS NOT PRECISELY DEFINED IN THE RI REPORT, EPA WOULD ENSURE THAT THE GROUND WATER REMEDY TO BE DESIGNED WOULD INCLUDE PROVISIONS TO ADDRESS THE EDGES OF THE PLUME, E.G., CAPTURE ZONES THAT EXTEND SLIGHTLY BEYOND THE ASSUMED EDGE OF THE PLUME.

EXTRACTION WELLS WOULD NOT BE PLACED IMMEDIATELY UPGRADIENT TO SEVERAL SPRINGS IN THE VICINITY OF THE TROUT FARM SINCE THE TROUT FARM RELIES UPON SPRING WATER FOR RAISING FISH. EPA ANTICIPATES THAT HIGH RATES OF GROUND WATER PUMPING CLOSE TO THE SPRINGS COULD SUBSTANTIALLY REDUCE SPRING FLOW RATES. SIMILARLY, EXTRACTION WELLS WOULD NOT BE PLACED WITHIN THE RESIDENTIAL AREA SINCE IT IS PLAUSIBLE THAT CERTAIN RESIDENTIAL WELLS WOULD STILL BE USED FOR RESTRICTED USES. IN ADDITION, EXTRACTION WELLS THAT MUST BE LOCATED NEAR THE NEW WATER SUPPLY

CONSTRUCTED PURSUANT TO OUI WOULD BE OPERATED IN SUCH A MANNER THAT THE YIELD OF THE NEW WATER SUPPLY WELL WOULD NOT BE DIMINISHED. EPA BELIEVES THAT AVOIDING THESE TWO IDENTIFIED AREAS WOULD NOT SIGNIFICANTLY IMPACT THE GROUND WATER CLEANUP. HOWEVER, A SMALL AREA OF CONTAMINATED GROUND WATER LOCATED BETWEEN PROPOSED EXTRACTION WELLS AND THE TROUT FARM SPRINGS WOULD CONTINUE TO MIGRATE TO THE SPRINGS AND DISCHARGE TO SURFACE WATER FOR AN UNKNOWN LENGTH OF TIME UNTIL FLUSHED VIA NATURAL PROCESSES. THE EXISTING CONTAMINANT LEVELS IN THIS AREA ARE NOT WELL DEFINED, BUT APPEAR TO BE WITHIN DRINKING WATER STANDARDS, I.E., MCLS, AND THEREFORE COULD BE CONSIDERED BY EPA TO BE BEYOND THE AREA OF ATTAINMENT. ALTERNATIVELY, THE EXTRACTION WELLS COULD BE PLACED AT THE DOWNGRAIENT EDGE OF THE PLUME. THIS PLACEMENT COULD DECREASE THE FLOW OF SPRINGS IN THE VICINITY OF THE TROUT FARM. ADDITIONAL WATER NEEDED BY THE TROUT FARM COULD BE DELIVERED FOLLOWING TREATMENT TO REQUIRED LEVELS, E.G., FEDERAL AMBIENT WATER QUALITY CRITERIA UNDER THE CLEAN WATER ACT. THIS OPTION WOULD NECESSITATE COORDINATION WITH THE OWNER AND OPERATOR OF THE TROUT FARM.

THE PUMPING AND TREATING OF GROUND WATER WOULD CONTINUE UNTIL THE CLEANUP GOALS ARE ACHIEVED, IF PRACTICABLE. ONCE CLEANUP GOALS ARE ACHIEVED, THE RISK POSED BY THE GROUND WATER WOULD BE REDUCED FROM THE (10-3) EXCESS CANCER RISK RANGE TO THE 1 X (10-6) EXCESS CANCER RISK LEVEL, AT MINIMUM.

PERIODIC MONITORING

SAMPLES OF TREATED GROUND WATER WOULD BE COLLECTED PERIODICALLY, E.G., MONTHLY OR QUARTERLY, TO ENSURE THAT THE TREATMENT TECHNOLOGIES EMPLOYED ARE REDUCING CONTAMINANT LEVELS TO REQUIRED STANDARDS. SAMPLES WOULD ALSO BE COLLECTED FROM SELECT MONITORING LOCATIONS TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS.

EACH ALTERNATIVE DEVELOPED UNDER GENERAL ALTERNATIVE 2 IS FURTHER DETAILED BELOW.

ALTERNATIVE 2A - GROUND WATER EXTRACTION, TREATMENT BY AIR STRIPPING, AND DISCHARGE TO AQUIFER RECHARGE WELLS

CAPITAL COST:	\$ 2,003,000
ANNUAL O&M COST:	\$ 97,000
PRESENT WORTH:	\$ 2,923,000
IMPLEMENTATION:	10-16 MONTHS

THE GENERAL COMPONENTS OF ALTERNATIVE 2A ARE:

1. COMPLETION OF A GROUND WATER REMEDIAL DESIGN STUDY TO DETERMINE THE DESIGN SPECIFICATIONS AND PERFORMANCE CRITERIA OF THE REMEDIATION SYSTEM;
2. INSTALLATION, OPERATION, AND MAINTENANCE OF GROUND WATER EXTRACTION WELLS TO REMOVE CONTAMINATED GROUND WATER;
3. INSTALLATION, OPERATION, AND MAINTENANCE OF AIR STRIPPING TOWERS TO TREAT GROUND WATER;

4. INSTALLATION, OPERATION, AND MAINTENANCE OF AQUIFER RECHARGE WELLS TO INJECT TREATED GROUND WATER BACK INTO THE AQUIFER; AND
5. PERIODIC MONITORING TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS AND THAT TREATED GROUND WATER MEETS REQUIRED STANDARDS.

IN ADDITION TO THE GROUND WATER REMEDIAL DESIGN STUDY, GROUND WATER EXTRACTION COMPONENTS, AND PERIODIC MONITORING DESCRIBED ABOVE, ALTERNATIVE 2A EMPLOYS AIR STRIPPING TOWERS TO TREAT CONTAMINATED GROUND WATER TO REQUIRED STANDARDS AND RECHARGE WELLS TO INJECT TREATED GROUND WATER BACK INTO THE AQUIFER. AN AIR STRIPPING TOWER IS AN EFFECTIVE TECHNOLOGY THAT REDUCES THE LEVELS OF CONTAMINANT IN WATER. CONTAMINATED GROUND WATER IS PUMPED TO THE TOP OF AN AIR STRIPPING TOWER AND DISCHARGED INTO A COLUMN OF PLASTIC SPHERES WITH LARGE SURFACE AREAS. AT THE SAME TIME, AIR IS FORCED UP THROUGH THE CONTAMINATED GROUND WATER IN THE TOWER. SINCE THE CONTAMINANTS ARE VOCs, WHICH TEND TO LEAVE WATER AND MOVE INTO AIR, THE AIR STRIPPING TOWER EFFICIENTLY REMOVES CONTAMINANTS FROM THE WATER. THE AIR STREAM LEAVING THE TOP OF THE AIR STRIPPING TOWER CONTAINS THE CONTAMINANTS WHICH ARE THEN VENTED INTO THE ATMOSPHERE.

PRELIMINARY CALCULATIONS SUGGEST THAT THE TOTAL VOC EMISSIONS FROM THE AIR STRIPPING TOWERS WOULD BE WELL BELOW FEDERAL AND STATE STANDARDS, E.G., NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)(40 CFR PART 50) PROMULGATED PURSUANT TO THE CLEAN AIR ACT, WHICH ARE TRANSLATED INTO SOURCE SPECIFIC EMISSION LIMITATIONS BY THE COMMONWEALTH OF PENNSYLVANIA.

AN EMISSION RATE, MORE STRINGENT THAN THE NAAQS, TO BE CONSIDERED IS EPA'S POLICY OF INSTALLING AIR CONTROLS ON TREATMENT UNITS THAT EMIT MORE THAN 3 LBS./HOUR OR 15 LBS./DAY OF TOTAL VOCs IN OZONE NON-ATTAINMENT AREAS. AN OZONE NON-ATTAINMENT AREA IS AN AREA IN WHICH THE NAAQS FOR OZONE IS NOT MET. THE CRYOCHEM SITE IS IN AN OZONE NON-ATTAINMENT AREA. EPA'S POLICY WAS DEVELOPED SINCE MOST VOCs TREATED AT SUPERFUND SITES ARE PRECURSORS TO THE FORMATION OF GROUND LEVEL OZONE. HOWEVER, CURRENT CALCULATIONS OF AIR EMISSIONS FROM THE AIR STRIPPING TOWERS SUGGEST THAT TOTAL EMISSION RATES WOULD BE APPROXIMATELY 1 LB/DAY, THUS AIR CONTROLS WOULD NOT BE REQUIRED. A VAPOR PHASE, CARBON ADSORPTION UNIT COULD BE INSTALLED, IF NEEDED, TO TREAT EMISSIONS FROM THE AIR STRIPPING TOWER.

THE COMMONWEALTH OF PENNSYLVANIA REQUIRES A "REQUEST FOR DETERMINATION OF REQUIREMENT FOR PLAN APPROVAL/OPERATING PERMIT APPLICATION" BE SUBMITTED FOR APPROVAL BEFORE A NEW AIR STRIPPING UNIT IS OPERATED AS PART OF THIS ALTERNATIVE. PADER WOULD THEN DETERMINE FROM THE INFORMATION PROVIDED WHETHER A PLAN APPROVAL OR THE SUBSTANTIVE REQUIREMENTS OF A PERMIT ACTION ARE, AND IF SO, WHAT EMISSION LIMITS WILL BE ESTABLISHED.

THE ACTUAL FLOW RATE AND VOC LOADING RATE, I.E., THE AMOUNT OF VOCs ENTERING THE AIR STRIPPER PER UNIT TIME, FOR THIS SITE WOULD NOT BE KNOWN UNTIL THE GROUND WATER REMEDIAL DESIGN STUDY IS COMPLETED AND THE

EXTRACTION SYSTEM IS OPERATIONAL. AFTERWARDS, THE AIR STRIPPING TOWERS WOULD BE TESTED TO ENSURE THAT THEY PERFORM SATISFACTORILY. THE TESTING WOULD INCLUDE PERIODIC SAMPLING TO ENSURE THAT THE TREATMENT UNITS SATISFACTORILY REDUCE VOC LEVELS IN TREATED GROUND WATER TO REQUIRED LEVELS, E.G., MCLS IDENTIFIED IN THE SAFE DRINKING WATER ACT. ADDITIONALLY, THE EMISSIONS FROM THE AIR STRIPPING TOWER WOULD BE TESTED TO ENSURE THAT MAXIMUM VOC EMISSION RATES DO NOT EXCEED 3 LBS./HOUR OR 15 LBS/DAY OR THE AMOUNT TO BE DETERMINED BY PADER.

THE GROUND LEVELS OF VOCs EMITTED FROM THE AIR STRIPPING TOWERS WOULD BE MODELLED TO DETERMINE THE CONCENTRATIONS THAT WOULD BE EXPECTED IN PROXIMITY TO THE AIR STRIPPING TOWER. THIS INFORMATION IS USED BY PADER TO EVALUATE THE AIR STRIPPER OPERATION PLAN. PADER MAY DETERMINE THAT THE AIR EMISSIONS MUST BE CONTROLLED USING THE BEST AVAILABLE TECHNOLOGY UNLESS THE AIR STRIPPERS ARE EXEMPTED PURSUANT TO 25 PA CODE SECTION 127 ET SEQ.

TREATED GROUND WATER WOULD THEN BE INJECTED INTO THE AQUIFER THROUGH SEVERAL RECHARGE WELLS. A RECHARGE WELL INJECTS WATER BACK INTO THE AQUIFER UNDER PRESSURE. THE WATER WOULD BE INJECTED OUTSIDE THE BOUNDARIES OF THE PLUME TO ELEVATE THE WATER TABLE AND PREVENT THE PLUME FROM EXPANDING. BECAUSE THE RECHARGE WELLS WOULD INCREASE HYDRAULIC GRADIENTS, THEY COULD ALSO DECREASE THE REMEDIATION TIME FRAME BY CAUSING CONTAMINANTS TO MOVE TOWARDS THE EXTRACTION WELLS MORE QUICKLY. THE FS ESTIMATES THAT 7 RECHARGE WELLS WOULD BE NEEDED. SINCE ALTERNATIVE 2A UTILIZES INJECTION WELLS, THE SUBSTANTIVE REQUIREMENTS OF AN UNDERGROUND INJECTION WELL PERMIT WOULD BE MET.

THE ESTIMATED CAPITAL COST, OPERATION AND MAINTENANCE COST, AND NET PRESENT WORTH COST FOR ALTERNATIVE 2A ARE DEPICTED IN TABLE 18. IN ADDITION, EPA ANTICIPATES THE IMPLEMENTATION TIMEFRAME FOR ALTERNATIVE 2A TO BE BETWEEN TEN AND SIXTEEN MONTHS.

ALTERNATIVE 2B - GROUND WATER EXTRACTION, TREATMENT BY CARBON ADSORPTION, AND DISCHARGE TO AQUIFER RECHARGE WELLS

CAPITAL COST:	\$ 2,152,000
ANNUAL O&M COST:	\$ 167,700
PRESENT WORTH:	\$ 3,086,000
IMPLEMENTATION:	10-16 MONTHS

THE GENERAL COMPONENTS OF ALTERNATIVE 2B ARE:

1. COMPLETION OF A GROUND WATER REMEDIAL DESIGN STUDY TO DETERMINE THE DESIGN SPECIFICATIONS AND PERFORMANCE CRITERIA OF THE REMEDIATION SYSTEM;
2. INSTALLATION, OPERATION, AND MAINTENANCE OF GROUND WATER EXTRACTION WELLS TO REMOVE CONTAMINATED GROUND WATER;
3. INSTALLATION, OPERATION, AND MAINTENANCE OF CARBON ADSORPTION UNITS TO TREAT GROUND WATER;
4. INSTALLATION, OPERATION, AND MAINTENANCE OF AQUIFER

RECHARGE WELLS TO INJECT TREATED GROUND WATER BACK INTO THE AQUIFER; AND

5. PERIODIC MONITORING TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS AND THAT TREATED GROUND WATER MEETS REQUIRED STANDARDS.

IN ADDITION TO THE GROUND WATER REMEDIAL DESIGN STUDY, GROUND WATER EXTRACTION COMPONENTS, AND PERIODIC MONITORING DESCRIBED ABOVE, ALTERNATIVE 2B EMPLOYS CARBON ADSORPTION UNITS TO TREAT CONTAMINATED GROUND WATER AND RELIES UPON RECHARGE WELLS TO INJECT TREATED GROUND WATER BACK INTO THE AQUIFER. ALTERNATIVE 2B IS SIMILAR TO ALTERNATIVE 2A EXCEPT CARBON ADSORPTION UNITS WOULD BE USED TO TREAT GROUND WATER.

A CARBON ADSORPTION UNIT IS A PRESSURIZED VESSEL FILLED WITH ACTIVATED CARBON. THE UNITS ARE SIMILAR TO THE CARBON UNITS CURRENTLY INSTALLED AT AFFECTED HOMES, ONLY LARGER, IN ORDER TO HANDLE INCREASED FLOW. AS CONTAMINATED GROUND WATER PASSES THROUGH THE CARBON UNIT, THE CONTAMINANTS ADSORB ONTO THE SURFACES OF THE CARBON. IF CONTAMINATED GROUND WATER PASSES THROUGH SUFFICIENT CARBON SURFACE AREA, CONTAMINANTS ARE COMPLETELY REMOVED FROM THE DISCHARGED GROUND WATER.

THERE ARE NO AIR EMISSIONS THAT WOULD REQUIRE AIR CONTROLS, BUT THE CARBON HAS LIMITED ADSORPTIVE CAPACITY AND MUST BE REPLACED. WHEN THE CARBON IS SATURATED WITH CONTAMINANTS OR SPENT, I.E., CONTAMINANTS HAVE ADSORBED ONTO ALL AVAILABLE SURFACE AREA, ADDITIONAL CONTAMINANTS ARE

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NOT REMOVED FROM GROUND WATER WHICH CONTINUES TO PASS THROUGH. THE SPENT CARBON MUST BE REMOVED, REGENERATED, AND REPLACED. DURING THE REGENERATION PROCESS, THE CARBON VENDOR TYPICALLY HEATS THE CARBON TO DRIVE OFF THE CONTAMINANTS AND THEN COLLECTS THE CONTAMINANTS. THE CONTAMINANTS COULD THEN BE COMPLETELY DESTROYED OR OTHERWISE REUSED. THE SPENT CARBON COULD NOT BE DISPOSED OF IN A LANDFILL SINCE IT WOULD MOST LIKELY FAIL THE TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP) AND WOULD THEREFORE BE RESTRICTED UNDER THE RCRA LAND DISPOSAL RESTRICTIONS. THE TCLP IS A TEST DURING WHICH A MEDIA, E.G., SPENT CARBON, IS SUBJECTED TO STANDARDIZED TESTS DURING WHICH THE AMOUNT OF CONTAMINANTS WHICH COULD LEACH FROM THE TESTED MEDIA IS DETERMINED. EPA BELIEVES THAT THE AMOUNT OF VOCs LEACHED FROM THE SPENT CARBON WOULD BE HIGH ENOUGH TO TRIGGER THE LAND DISPOSAL RESTRICTIONS UNDER RCRA, MEANING THAT A NON-LAND BASED DISPOSAL METHOD WOULD BE REQUIRED (SUCH AS INCINERATION). THUS, THE SPENT CARBON LIKELY WOULD BE REGENERATED BY THE CARBON VENDOR, AN ENTITY WHICH WOULD POSSESS A RCRA PERMIT ALLOWING THE VENDOR TO REGENERATE THE CARBON, CONTAIN THE VOCs, AND PROVIDE FOR THEIR ULTIMATE DESTRUCTION. FOR EXAMPLE, THE CONTAMINANTS REMOVED FROM THE SPENT CARBON COULD BE INCINERATED.

THE ESTIMATED CAPITAL COST, OPERATION AND MAINTENANCE COST, AND NET PRESENT WORTH COST FOR ALTERNATIVE 2B ARE DEPICTED IN TABLE 19. IN ADDITION, EPA ESTIMATES THE IMPLEMENTATION TIMEFRAME FOR ALTERNATIVE 2B TO BE BETWEEN TEN AND SIXTEEN MONTHS.

ALTERNATIVE 2C - GROUND WATER EXTRACTION, TREATMENT BY AIR STRIPPING,
AND DISCHARGE TO SURFACE WATER

CAPITAL COST:	\$ 1,356,000
ANNUAL O&M COST:	\$ 75,200
PRESENT WORTH:	\$ 2,065,000
IMPLEMENTATION:	10-16 MONTHS

THE GENERAL COMPONENTS OF ALTERNATIVE 2C ARE:

1. COMPLETION OF A GROUND WATER REMEDIAL DESIGN STUDY TO DETERMINE THE DESIGN SPECIFICATIONS AND PERFORMANCE CRITERIA OF THE REMEDIATION SYSTEM;
2. INSTALLATION, OPERATION, AND MAINTENANCE OF GROUND WATER EXTRACTION WELLS TO REMOVE CONTAMINATED GROUND WATER;
3. INSTALLATION, OPERATION, AND MAINTENANCE OF AIR STRIPPING TOWERS TO TREAT GROUND WATER;
4. INSTALLATION AND MAINTENANCE OF A DISCHARGE PIPE TO LOCAL SURFACE WATER; AND
5. PERIODIC MONITORING TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS AND THAT TREATED GROUND WATER MEETS REQUIRED STANDARDS.

IN ADDITION TO THE GROUND WATER REMEDIAL DESIGN STUDY, GROUND WATER EXTRACTION COMPONENTS, AND PERIODIC MONITORING DESCRIBED ABOVE, ALTERNATIVE 2C EMPLOYS AIR STRIPPING TOWERS TO TREAT CONTAMINATED GROUND WATER AND RELIES UPON A PIPELINE TO THE NEARBY STREAM TO DISCHARGE TREATED WATER. THE TREATMENT COMPONENT, AIR STRIPPING TOWERS, OF ALTERNATIVE 2C IS SIMILAR TO THAT OF ALTERNATIVE 2A AND HAS BEEN DISCUSSED ABOVE.

A PIPELINE WOULD BE CONSTRUCTED FROM THE AIR STRIPPING TOWERS TO THE NEARBY STREAM. THE PIPELINE WOULD BE SIZED TO ACCOMMODATE THE MAXIMUM FLOW FROM THE TREATMENT UNITS. THE CONSTRUCTION OF THE PIPELINE WOULD CONSIDER THE LOCATION OF ANY IDENTIFIED WETLANDS OR OTHER SENSITIVE HABITATS. THE LOCATION OF ANY SEEPS OF CONTAMINATED GROUND WATER ALONG THE STREAM WOULD ALSO BE CONSIDERED AS CANDIDATE LOCATIONS FOR THE TREATED GROUND WATER DISCHARGE. PRIOR TO FULL OPERATION OF THE TREATMENT UNITS, APPROPRIATE TESTING OF THE TREATED WATER WOULD BE COMPLETED TO ENSURE THAT NO IMPACTS TO SENSITIVE DOWNSTREAM ENVIRONMENTS WOULD RESULT FROM THE DISCHARGE OF TREATED WATER INTO THE STREAM.

THE AMOUNT OF CONTAMINANTS DISCHARGED FROM THE TREATMENT UNIT INTO THE STREAM WOULD COMPLY WITH THE SUBSTANTIVE REQUIREMENTS OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT. THE NPDES REQUIREMENTS WOULD ESTABLISH DISCHARGE LIMITS WHICH ARE PROTECTIVE OF THE RECEIVING STREAM. THE DISCHARGE LIMITS CONSIDER THE DESIGNATED USES OF THE RECEIVING STREAM, I.E., IRONSTONE CREEK. SUBSTANTIVE REQUIREMENTS OF NPDES WOULD INCLUDE WATER QUALITY CRITERIA AND STANDARDS ESTABLISHED BY EPA AND THE COMMONWEALTH OF PENNSYLVANIA UNDER SECTIONS

303 AND 304 OF THE CLEAN WATER ACT, 33 USC SECTIONS 1313 AND 1314. SINCE THE DISCHARGE WOULD BE LOCATED IN AN "ON-SITE" AREA, I.E., INTO AN AREA OF THE STREAM WHICH IS CONSIDERED PART OF THE SITE, THE ADMINISTRATIVE REQUIREMENTS OF THE PERMITTING PROCESS AND AN ACTUAL NPDES PERMIT WOULD NOT BE NEEDED.

THE ESTIMATED CAPITAL COST, OPERATION AND MAINTENANCE COST, AND NET PRESENT WORTH COST FOR ALTERNATIVE 2C ARE DEPICTED IN TABLE 20. IN ADDITION, EPA ESTIMATES THE IMPLEMENTATION TIMEFRAME FOR ALTERNATIVE 2C TO BE BETWEEN TEN AND SIXTEEN MONTHS.

ALTERNATIVE 2D - GROUND WATER EXTRACTION, TREATMENT BY CARBON ADSORPTION, AND DISCHARGE TO SURFACE WATER

CAPITAL COST:	\$ 1,507,000
ANNUAL O&M COST:	\$ 145,300
PRESENT WORTH:	\$ 2,877,000
IMPLEMENTATION:	10-16 MONTHS

THE GENERAL COMPONENTS OF ALTERNATIVE 2D ARE:

1. COMPLETION OF A GROUND WATER REMEDIAL DESIGN STUDY TO DETERMINE THE DESIGN SPECIFICATIONS AND PERFORMANCE CRITERIA OF THE REMEDIATION SYSTEM;
2. INSTALLATION, OPERATION, AND MAINTENANCE OF GROUND WATER EXTRACTION WELLS TO REMOVE CONTAMINATED GROUND WATER;
3. INSTALLATION, OPERATION, AND MAINTENANCE OF CARBON ADSORPTION UNITS TO TREAT GROUND WATER;
4. INSTALLATION AND MAINTENANCE OF A DISCHARGE PIPE TO LOCAL SURFACE WATER; AND
5. PERIODIC MONITORING TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS AND THAT TREATED GROUND WATER MEETS REQUIRED STANDARDS.

IN ADDITION TO THE GROUND WATER REMEDIAL DESIGN STUDY, GROUND WATER EXTRACTION COMPONENTS, AND PERIODIC MONITORING DESCRIBED ABOVE, ALTERNATIVE 2D EMPLOYS CARBON ADSORPTION UNITS TO TREAT CONTAMINATED GROUND WATER AND A PIPELINE TO DISCHARGE TREATED GROUND WATER INTO THE NEARBY STREAM. THE TREATMENT COMPONENT OF ALTERNATIVE 2D, CARBON ADSORPTION UNITS, IS SIMILAR TO THAT OF ALTERNATIVE 2B AND HAS BEEN DISCUSSED ABOVE. THE DISCHARGE COMPONENT OF ALTERNATIVE 2D, SURFACE WATER DISCHARGE, IS SIMILAR TO THAT OF ALTERNATIVE 2C AND HAS BEEN DISCUSSED ABOVE.

THE ESTIMATED CAPITAL COST, OPERATION AND MAINTENANCE COST, AND NET PRESENT WORTH COST FOR ALTERNATIVE 2D ARE DEPICTED IN TABLE 21. IN ADDITION, EPA ESTIMATES THE IMPLEMENTATION TIMEFRAME FOR ALTERNATIVE 2D TO BE BETWEEN TEN AND SIXTEEN MONTHS.

#SCAA

X. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

EACH OF THE REMEDIAL ALTERNATIVES FOR OU2 WAS COMPARED AND EVALUATED AGAINST NINE CRITERIA TO DETERMINE WHICH REMEDIAL ALTERNATIVE AND COMBINATION OF TECHNOLOGIES AND PROCESS OPTIONS WOULD BEST MEET THE REMEDIAL OBJECTIVES OF THIS RESPONSE ACTION. THE EVALUATION OF REMEDIAL ALTERNATIVES AGAINST THE NINE CRITERIA IS REQUIRED BY THE NCP, SEE 40 CFR SECTION 300.430(E)(9)(III). THE NINE CRITERIA, GROUPED BY CLASSIFICATION, ARE:

THRESHOLD CRITERIA

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: WHETHER EACH ALTERNATIVE PROVIDES ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND DESCRIBES HOW RISKS POSED THROUGH EACH EXPOSURE PATHWAY ARE ELIMINATED, REDUCED OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS.

COMPLIANCE WITH ARARS: WHETHER EACH ALTERNATIVE WILL MEET ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) OF FEDERAL AND STATE ENVIRONMENTAL LAWS AND/OR JUSTIFIES INVOKING A WAIVER; WHETHER A REMEDY COMPLIES WITH ADVISORIES, CRITERIA AND GUIDANCE THAT EPA AND PADER HAVE AGREED TO FOLLOW.

PRIMARY BALANCING CRITERIA

LONG-TERM EFFECTIVENESS AND PERMANENCE: THE ABILITY OF EACH ALTERNATIVE TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME, ONCE CLEAN-UP GOALS HAVE BEEN MET.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT: ADDRESSES THE STATUTORY PREFERENCE FOR SELECTING REMEDIAL ACTIONS THAT EMPLOY TREATMENT TECHNOLOGIES THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE TOXICITY, MOBILITY OR VOLUME OF HAZARDOUS SUBSTANCES.

SHORT-TERM EFFECTIVENESS: THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD, UNTIL CLEAN-UP GOALS ARE ACHIEVED.

IMPLEMENTABILITY: THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT A PARTICULAR OPTION.

COST: ESTIMATED CAPITAL, OPERATION AND MAINTENANCE (O&M), AND NET PRESENT WORTH COSTS.

MODIFYING CRITERIA

STATE/SUPPORT AGENCY ACCEPTANCE: WHETHER THE STATE CONCURS WITH, OPPOSES, OR HAS NO COMMENT REGARDING THE PREFERRED ALTERNATIVE.

COMMUNITY ACCEPTANCE: THE PUBLIC'S GENERAL RESPONSE TO THE ALTERNATIVES.

THE FOLLOWING SECTION COMPARES EACH OF THE REMEDIAL ALTERNATIVES DEVELOPED IN THIS ROD AGAINST EACH OF THE NINE EVALUATION CRITERIA.

A. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

ALTERNATIVES 2B AND 2D PROVIDE THE MOST PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT FROM CURRENT AND FUTURE RISKS POSED BY THE SITE. THE RESPONSE ACTION FOR OUL ADDRESSED THE MOST SIGNIFICANT CURRENT RISK POSED BY THE SITE (INGESTION OF CONTAMINATED GROUND WATER), BUT DID NOT ADDRESS THE POTENTIAL FUTURE EXPOSURE TO CONTAMINATED GROUND WATER VIA INGESTION AND INHALATION. ALTERNATIVES 2B AND 2D PROVIDE PROTECTION FROM ANY POTENTIAL RISK THAT MIGHT RESULT FROM AIR EMISSIONS FROM THE TREATMENT UNITS SINCE ALTERNATIVES 2B AND 2D EMPLOY CARBON ADSORPTION UNITS THAT DO NOT GENERATE AIR EMISSIONS. SINCE ALTERNATIVE 2B RELIES UPON AQUIFER RECHARGE WELLS WHICH COULD RESULT IN MIGRATION OF CONTAMINANTS OUTSIDE THE CAPTURE ZONES OF THE EXTRACTION WELLS, RESULTING IN POTENTIAL UNKNOWN FUTURE RISK, ALTERNATIVE 2D PROVIDES THE MOST PROTECTION BECAUSE THE TREATED WATER WOULD BE DISCHARGED AT A KNOWN LOCATION AT REGULATED LEVELS.

THE AIR STRIPPING TOWER EMISSIONS THAT WOULD RESULT FROM IMPLEMENTATION OF ALTERNATIVES 2A AND 2C ARE NOT EXPECTED TO RESULT IN UNACCEPTABLE RISK TO PUBLIC HEALTH. THE CONTAMINANTS WOULD BE VENTED INTO THE ATMOSPHERE. THE EXPECTED CONTAMINANT EMISSION LEVELS WOULD BE WELL BELOW STANDARDS UNDER THE CLEAN AIR ACT AND WOULD ALSO BE BELOW EPA'S MORE STRINGENT LEVELS TO BE CONSIDERED UNDER EPA'S AIR EMISSION CONTROL POLICY (WHICH CONSIDERS REDUCTIONS IN GROUND LEVEL OZONE). THE EMISSIONS STILL PRESENT A SMALL RISK WHICH MAKES CARBON ADSORPTION UNITS (THE TREATMENT COMPONENTS UNDER ALTERNATIVES 2B AND 2D) MORE PROTECTIVE.

ALTERNATIVES WHICH EMPLOY AIR STRIPPING TOWERS CAN BE AS PROTECTIVE AS ALTERNATIVES EMPLOYING CARBON ADSORPTION UNITS IF VAPOR PHASE CARBON ADSORPTION UNITS ARE INSTALLED ON THE AIR STRIPPING TOWERS TO TREAT EMISSIONS. PADER WOULD FIRST REVIEW THE OPERATION PLAN FOR THE AIR STRIPPING TOWERS AND DETERMINE IF AIR CONTROLS ARE NEEDED. THE AIR STRIPPING TOWERS MAY BE EXEMPTED BY PADER FROM THE NEED FOR AIR CONTROLS PURSUANT TO 25 PA CODE SECTION 127 ET SEQ.

ALTERNATIVES 2A THROUGH 2D PROVIDE PROTECTION OF HUMAN HEALTH FROM POTENTIAL FUTURE RISKS POSED BY CONTAMINATED GROUND WATER AT THE SITE. ALTERNATIVE 1, THE NO ACTION ALTERNATIVE, DOES NOT PROVIDE PROTECTION OF HUMAN HEALTH OR THE ENVIRONMENT SINCE CONTAMINANTS WOULD REMAIN IN THE GROUND WATER ABOVE HEALTH-BASED LEVELS. THEREFORE, ALTERNATIVE 1 WILL NO LONGER BE CONSIDERED.

ALTERNATIVES 2A THROUGH 2D EACH PROTECT THE ENVIRONMENT. GROUND WATER PUMPING WOULD SERVE TO LOWER THE WATER TABLE AND REDUCE OR PREVENT THE DISCHARGE OF CONTAMINATED GROUND WATER INTO THE NEARBY STREAMS. IN ADDITION, REMEDIAL ALTERNATIVES EMPLOYING SURFACE WATER DISCHARGES WOULD FIRST TREAT THE CONTAMINATED GROUND WATER TO LEVELS PROTECTIVE OF THE RECEIVING STREAM PURSUANT TO THE NPDES PERMIT REQUIREMENTS.

B. COMPLIANCE WITH ARARS

TABLE 22 IDENTIFIES ARARS FOR THE ALTERNATIVES DEVELOPED IN THIS ROD.

UNDER SECTION 121(D) OF CERCLA, 42 USC SECTION 9621(D), AND EPA GUIDANCE, REMEDIAL ACTIONS AT CERCLA SITES MUST ATTAIN LEGALLY APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE ENVIRONMENTAL STANDARDS, REQUIREMENTS, CRITERIA, AND LIMITATIONS. APPLICABLE REQUIREMENTS ARE THOSE SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS PROMULGATED UNDER FEDERAL OR STATE LAW THAT SPECIFICALLY ADDRESS HAZARDOUS SUBSTANCES FOUND AT A SITE, THE REMEDIAL ACTION TO BE IMPLEMENTED, THE LOCATION OF A SITE, OR OTHER SPECIAL CIRCUMSTANCES. RELEVANT AND APPROPRIATE REQUIREMENTS ARE THOSE SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS PROMULGATED UNDER FEDERAL OR STATE LAW WHICH, WHILE NOT APPLICABLE TO THE HAZARDOUS SUBSTANCES AT A SITE, THE REMEDIAL ACTION, SITE LOCATION, OR OTHER CIRCUMSTANCES, NEVERTHELESS ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT A SITE THAT THEIR USE IS WELL SUITED TO THAT SITE.

ALTERNATIVES 2A THROUGH 2D WOULD COMPLY WITH ALL ARARS RELATED TO GROUND WATER.

THE COMMONWEALTH OF PENNSYLVANIA'S ARAR FOR GROUND WATER IS THAT ALL GROUND WATER MUST BE REMEDIATED TO "BACKGROUND" QUALITY AS SPECIFIED BY 25 PA CODE SECTIONS 264.90 THROUGH 264.100. THE COMMONWEALTH OF PENNSYLVANIA ALSO MAINTAINS THAT THE REQUIREMENT TO REMEDIATE TO BACKGROUND IS ALSO FOUND IN OTHER LEGAL AUTHORITIES.

THE GROUND WATER CLEANUP GOAL FOR THE SITE WOULD BE TO RESTORE THE AQUIFER TO ITS BENEFICIAL USE AS A DRINKING WATER AQUIFER. IN ORDER TO RESTORE THE AQUIFER TO ITS BENEFICIAL USE, THE REMEDIATION SYSTEM IMPLEMENTED IN EACH OF THE ALTERNATIVES WOULD OPERATE UNTIL SITE-SPECIFIC REMEDIATION GOALS ARE ACHIEVED. THUS THE AQUIFER WOULD BE REMEDIATED UNTIL THE CONTAMINATE LEVELS REACH THE MCLS, NON-ZERO MCLGS, OR BACKGROUND, WHICHEVER ARE LOWER.

IF IMPLEMENTATION OF THE SELECTED REMEDY DEMONSTRATES, IN CORROBORATION WITH HYDROGEOLOGICAL AND CHEMICAL EVIDENCE THAT IT WILL BE TECHNICALLY IMPRACTICABLE TO ACHIEVE AND MAINTAIN THE REMEDIATION GOALS THROUGHOUT THE AREA OF ATTAINMENT, THE USEPA IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO AMEND THE ROD OR ISSUE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO INFORM THE PUBLIC OF ALTERNATIVE GROUNDWATER GOALS.

ALTERNATIVES 2A AND 2C, WHICH EMPLOY AIR STRIPPERS, WOULD NOT EXCEED NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) ESTABLISHED UNDER THE CLEAN AIR ACT, CODIFIED AT 40 CFR PART 50, AND REGULATED BY THE COMMONWEALTH OF PENNSYLVANIA. HOWEVER, EPA HAS ESTABLISHED A MORE STRINGENT POLICY TO BE CONSIDERED IN SUPERFUND CLEANUPS THAT OCCUR IN OZONE NON-ATTAINMENT AREAS. THE MOST STRINGENT EMISSION RATE FROM ALL SOURCES EMPLOYED IN A SUPERFUND CLEANUP WOULD BE 3 LBS./HOUR OR 15 LBS./DAY OF TOTAL VOCs (OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, OSWER, DIRECTIVE 9355.0-28). CURRENT CALCULATIONS SUGGEST THAT TOTAL

EMISSIONS FROM THE AIR STRIPPERS WOULD NOT EXCEED 1 LB./DAY.

PADER REQUIRES THAT A "REQUEST FOR DETERMINATION OF REQUIREMENT FOR PLAN APPROVAL/OPERATING PERMIT APPLICATION" FORM BE SUBMITTED BEFORE A NEW AIR STRIPPING TOWER IS OPERATED. AN OPERATION PLAN MUST BE SUBMITTED AND REVIEWED BY THE DEPARTMENT IN ACCORDANCE WITH 25 PA CODE SECTION 127.11. PADER TYPICALLY REQUIRES THAT OPERATORS OF NEW SOURCES OF AIR CONTAMINATION CONTROL EMISSIONS UTILIZING THE BEST AVAILABLE TECHNOLOGY IN ACCORDANCE WITH 25 PA CODE SECTION 127.1, UNLESS OTHERWISE EXEMPTED. BEFORE AIR STRIPPERS ARE OPERATED AT THE SITE, AN OPERATION PLAN WILL BE SUBMITTED TO PADER. SHOULD AIR CONTROLS BE REQUIRED, AS DETERMINED BY PADER UPON REVIEW OF THE INFORMATION SUBMITTED, VAPOR PHASE CARBON ADSORPTION UNITS WOULD BE INSTALLED. VAPOR PHASE CARBON ADSORPTION UNITS REMOVE VOCs FROM THE AIR STREAM EXITING THE AIR STRIPPING TOWER. ONCE CONTAINED WITHIN THE CARBON ADSORPTION UNIT, THE VOCs COULD THEN BE DESTROYED.

ALTERNATIVES 2B AND 2D, EMPLOY CARBON ADSORPTION UNITS THAT WOULD NOT CAUSE RELEASE OF CONTAMINANTS INTO THE AIR. THE SPENT CARBON, HOWEVER, WOULD REQUIRE REGENERATION OR DISPOSAL SUBJECT TO THE LAND DISPOSAL RESTRICTIONS AND OTHER APPLICABLE REQUIREMENTS OF RCRA. THE SPENT CARBON WOULD MOST LIKELY BE A CHARACTERISTIC RCRA HAZARDOUS WASTE BECAUSE OF ITS SATURATION WITH VOCs. THUS, IT COULD NOT BE DISPOSED OF IN A LANDFILL. IN MOST CASES, HOWEVER, THE CARBON VENDOR HAS APPROPRIATE RCRA PERMITS. THUS, THE VENDOR WOULD ENSURE THAT THE CARBON IS REGENERATED AND THE VOCs ARE DISPOSED OF OR RECYCLED IN ACCORDANCE WITH REQUIREMENTS OF RCRA. IN ADDITION, THE SPENT CARBON WOULD BE PROPERLY TRANSPORTED AND MANIFESTED IN ACCORDANCE WITH RCRA REGULATIONS, SEE 40 CFR PARTS 262 AND 263. IF VAPOR PHASE CARBON IS USED TO CONTROL AIR EMISSIONS IN ALTERNATIVES 2A AND 2C, THEN THE SAME DISPOSAL RESTRICTIONS WOULD APPLY.

ALTERNATIVES 2A AND 2B, WHICH RELY UPON AQUIFER RECHARGE WELLS, WOULD NEED TO COMPLY WITH THE SUBSTANTIVE REQUIREMENTS OF AN UNDERGROUND INJECTION WELL PERMIT. THE REQUIREMENTS ARE STATED WITHIN THE UNDERGROUND INJECTION CONTROL PROGRAM REGULATIONS WITHIN THE SAFE DRINKING WATER ACT, SEE 40 CFR PARTS 144, 145, 146 AND 147.

ALTERNATIVES 2C AND 2D, WHICH RELY UPON DISCHARGING TREATED GROUND WATER INTO A NEARBY SURFACE WATER BODY, WOULD COMPLY WITH THE SUBSTANTIVE REQUIREMENTS OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT. THE NPDES PERMITTING PROCEDURE IS REGULATED BY THE COMMONWEALTH OF PENNSYLVANIA UNDER THE CLEAN STREAMS LAW, 25 PA CODE SECTIONS 92.1 ET SEQ. IN ADDITION, THE CONTAMINANT LEVELS IN THE STREAM WOULD COMPLY WITH AMBIENT WATER QUALITY CRITERIA ESTABLISHED UNDER THE CLEAN WATER ACT AND PENNSYLVANIA WATER QUALITY CRITERIA ESTABLISHED UNDER THE CLEAN STREAMS LAW, 25 PA CODE CHAPTER 93. THE TREATMENT TECHNOLOGIES IN EACH OF THE ALTERNATIVES CAN BE DESIGNED TO MEET REQUIRED STANDARDS.

C. LONG-TERM EFFECTIVENESS AND PERMANENCE

ALTERNATIVES 2A THROUGH 2D EMPLOY POTENTIALLY RELIABLE TREATMENT TECHNOLOGIES. THE LEVELS OF CONTAMINANTS IN THE GROUND WATER WOULD BE

REDUCED TO DRINKING WATER STANDARDS OR BACKGROUND, IF PRACTICABLE. LONG-TERM PERIODIC SAMPLING WOULD BE REQUIRED TO ENSURE THAT THE CARBON ADSORPTION UNITS AND AIR STRIPPERS ARE PROPERLY MAINTAINED AND ARE OPERATING ACCORDING TO PERFORMANCE STANDARDS.

ALTERNATIVES EMPLOYING AIR STRIPPING TOWERS (2A AND 2C) HAVE FEWER OPERATION AND MAINTENANCE REQUIREMENTS, BUT MAY NEED ADDITIONAL CONTROLS INSTALLED IF EMISSION RATES EXCEED REQUIRED STANDARDS. AIR EMISSIONS CONTROLS MAY ALSO BE REQUIRED UPON PADER REVIEW OF THE OPERATION PLANS FOR THE AIR STRIPPERS, UNLESS THESE NEW SOURCES ARE EXEMPTED. ALTERNATIVES EMPLOYING CARBON ADSORPTION UNITS TO TREAT GROUND WATER MAY REQUIRE INCREASED SAMPLING FREQUENCY TO ENSURE THAT CONTAMINANTS DO NOT BREAK THROUGH THE CARBON AND, THEREFORE, DISCHARGE AT LEVELS ABOVE THE REQUIRED STANDARDS. ALTERNATIVES EMPLOYING CARBON TREATMENT UNITS WOULD RESULT IN THE DESTRUCTION OF CONTAMINANTS, WHEREAS ALTERNATIVES THAT EMPLOY AIR STRIPPING TOWERS WOULD RESULT IN LOW LEVELS OF UNCONTROLLED RELEASES OF CONTAMINANTS INTO THE ATMOSPHERE (AT LEVELS THAT ARE NOT CONSIDERED TO PRESENT A RISK).

ALTERNATIVES WHICH EMPLOY AQUIFER RECHARGE WELLS (2A AND 2B) ARE SUBJECT TO POTENTIAL FAILURE IF RECHARGE WELLS ARE NOT PROPERLY MAINTAINED. RECHARGE WELLS TEND TO CLOG OVER TIME, NECESSITATING CONTINUED MAINTENANCE. IN ADDITION, RECHARGE WELLS COULD CAUSE CONTAMINANTS TO MIGRATE OUTSIDE THE CAPTURE ZONE OF THE EXTRACTION WELLS, RESULTING IN RESIDUAL RISK WITHIN THE GROUND WATER SYSTEM IF NOT PROPERLY LOCATED AND OPERATED.

D. REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

ALTERNATIVE 2D PROVIDES THE GREATEST REDUCTION IN CONTAMINANT VOLUME, TOXICITY, AND MOBILITY. THE CONTAMINANTS, WHICH WERE DISPERSED THROUGHOUT THE GROUND WATER, WOULD BE ADSORBED ONTO ACTIVATED CARBON AND COULD THEN BE COLLECTED FOR APPROPRIATE DISPOSAL OR DESTRUCTION. TREATED WATER WOULD NO LONGER CONTAIN TOXIC LEVELS OF CONTAMINANTS. AQUIFER RECHARGE WELLS COULD POTENTIALLY RESULT IN THE MOVEMENT OF CONTAMINANTS OUTSIDE THE CAPTURE ZONE OF THE GROUND WATER EXTRACTION SYSTEM THEREBY INCREASING THE VOLUME OF CONTAMINATED MEDIA. ALTERNATIVE 2C WOULD PROVIDE THE SAME REDUCTION IN TOXICITY, MOBILITY, OR VOLUME IF AIR CONTROLS WERE INSTALLED ON THE AIR STRIPPING TOWERS.

THE GROUND WATER RISK POSED BY THE SITE IS IN THE RANGE OF (10-3). THE RISK POSED BY THE EMISSIONS FROM THE AIR STRIPPING TOWERS TO NEARBY RESIDENTS WOULD MOST LIKELY BE LESS THAN (10-6).

E. SHORT-TERM EFFECTIVENESS

EPA ANTICIPATES THAT IMPLEMENTATION OF ANY OF THE ALTERNATIVES WOULD NOT RESULT IN INCREASED EXPOSURE TO CONTAMINANTS.

SENSITIVE ENVIRONMENTS, POTENTIALLY LOCATED DOWNSTREAM OF THE SITE, COULD BE NEGATIVELY AFFECTED IN THE NEAR-TERM BY INCREASED STREAM FLOW AND POTENTIAL INCREASES IN CONTAMINANTS OF CONCERN.

F. IMPLEMENTABILITY

ADDITIONAL FIELDWORK MUST BE COMPLETED BEFORE AN EFFICIENT REMEDY CAN BE DESIGNED AND CONSTRUCTED. THEREFORE, ACTUAL CONSTRUCTION REQUIREMENTS AND ASSOCIATED IMPLEMENTATION REQUIREMENTS ARE UNKNOWN AT THIS TIME. HOWEVER, THE TECHNOLOGIES CONSIDERED IN EACH ALTERNATIVE ARE GENERALLY EASILY CONSTRUCTED FROM READILY AVAILABLE COMPONENTS. EPA HAS EXTENSIVE EXPERIENCE IN IMPLEMENTING GROUND WATER PUMP AND TREAT REMEDIES.

ALTERNATIVES EMPLOYING AQUIFER RECHARGE WELLS RATHER THAN SURFACE WATER DISCHARGES MAY BE UNRELIABLE SINCE RECHARGE WELLS MAY BE DIFFICULT TO LOCATE AND CONSTRUCT TO EFFICIENTLY INJECT TREATED WATER BACK INTO THE AQUIFER. EACH ALTERNATIVE REQUIRES COORDINATION WITH THE PADER. SURFACE WATER DISCHARGES REQUIRE DEVELOPMENT OF DISCHARGE REQUIREMENTS, AQUIFER RECHARGE WELLS REQUIRE DEVELOPMENT OF PERMIT REQUIREMENTS, AND AIR STRIPPING TOWERS REQUIRE DEVELOPMENT AND APPROVAL OF OPERATION AND MANAGEMENT PLANS.

G. COST

THE ESTIMATED COST OF EACH ALTERNATIVE IS DEPICTED IN TABLE 23. ALTERNATIVE 2C PROVIDES THE NECESSARY PROTECTION DURING REMEDIATION, I.E., A RISK LEVEL WITHIN THE ACCEPTABLE RANGE STATED WITHIN THE NCP, FOR THE MOST REASONABLE COST. ALTERNATIVE 2D, WHICH IS MORE COSTLY THAN ALTERNATIVE 2C AND THE MOST COSTLY OF ALL ALTERNATIVES, EMPLOYS A DIFFERENT TREATMENT TECHNOLOGY (CARBON ADSORPTION) THAN ALTERNATIVE 2C, BUT PROVIDES THE MOST PROTECTION, I.E., NO RISK.

H. STATE ACCEPTANCE

THE COMMONWEALTH OF PENNSYLVANIA HAS REVIEWED THE RECORD OF DECISION AND HAS CONCURRED WITH THE SELECTED REMEDY.

I. COMMUNITY ACCEPTANCE

THE PUBLIC GENERALLY AGREED WITH EPA'S SELECTION OF GROUND WATER PUMPING, TREATING BY AIR STRIPPING TOWERS, AND DISCHARGING TO SURFACE WATER (ALTERNATIVE 2C OR ALTERNATIVE 3C AS DISCUSSED IN THE PROPOSED PLAN). DURING THE PUBLIC COMMENT PERIOD AND PUBLIC MEETING, THE COMMUNITY EXPRESSED CONCERN ABOUT THE LENGTHY REMEDIATION TIMEFRAME SINCE USE OF THEIR PRIVATE WELLS WOULD BE RESTRICTED DURING REMEDIATION. SOME COMMUNITY MEMBERS EXPRESSED CONCERN THAT THE GROUND WATER EXTRACTION SYSTEM WOULD LOWER WATER LEVELS IN THEIR WELLS OR REDUCE SPRING FLOWS CRITICAL TO THEIR BUSINESS. THE MAJORITY OF THE COMMUNITY'S CONCERNS APPLIED SIMILARLY TO ALL ALTERNATIVES. EPA'S RESPONSE TO PUBLIC COMMENTS IS CONTAINED WITHIN APPENDIX A.

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XI. SELECTED REMEDY

THE REMEDIAL ACTION ALTERNATIVES INCLUDED IN THE FINAL ANALYSIS FOR OU2 OF THE SITE WERE:

1. NO ACTION

2. GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE

- A. TREATMENT BY AIR STRIPPING, DISCHARGE TO RECHARGE WELLS
- B. TREATMENT BY CARBON ADSORPTION, DISCHARGE TO RECHARGE WELLS
- C. TREATMENT BY AIR STRIPPING, DISCHARGE TO SURFACE WATER
- D. TREATMENT BY CARBON ADSORPTION, DISCHARGE TO SURFACE WATER

THE SELECTED REMEDIAL ALTERNATIVE FOR OU2 IS ALTERNATIVE 2C.
SPECIFICALLY, THIS ROD SELECTS:

- 1. COMPLETION OF A GROUND WATER REMEDIAL DESIGN STUDY TO DETERMINE THE DESIGN SPECIFICATIONS OF THE REMEDIATION SYSTEM;
- 2. INSTALLATION, OPERATION, AND MAINTENANCE OF GROUND WATER EXTRACTION WELLS TO REMOVE CONTAMINATED GROUND WATER;
- 3. INSTALLATION, OPERATION, AND MAINTENANCE OF AIR STRIPPING TOWERS TO TREAT GROUND WATER;
- 4. INSTALLATION AND MAINTENANCE OF A DISCHARGE PIPE TO LOCAL SURFACE WATER; AND
- 5. PERIODIC MONITORING TO ENSURE THAT THE REMEDIATION IS PROGRESSING TOWARDS THE CLEANUP GOALS AND THAT TREATED GROUND WATER MEETS REQUIRED STANDARDS.

THE NUMBER, LOCATION AND CONSTRUCTION SPECIFICS OF THE GROUND WATER EXTRACTION WELL SYSTEM WOULD BE DETERMINED DURING THE COURSE OF THE GROUND WATER REMEDIAL DESIGN STUDY. THIS STUDY WILL BE INITIATED AS SOON AS POSSIBLE. SIMILARLY, THE DESIGN CRITERIA FOR THE TREATMENT UNITS (AIR STRIPPING TOWERS AND ASSOCIATED PUMPS AND PIPING) WOULD BE DETERMINED ONCE THE EXTRACTION WELLS ARE LOCATED AND A GROUND WATER FLOW RATE AND CONTAMINANT LOADING RATE COULD BE DETERMINED. THE PROBABLE LOCATIONS OF THE DISCHARGE OF TREATED GROUND WATER INTO THE NEARBY STREAM ARE KNOWN, BUT THE ACTUAL AMOUNT OF CONTAMINANTS AND THE VOLUME OF WATER THAT MAY BE DISCHARGED WOULD BE DETERMINED DURING THE COURSE OF THE GROUND WATER REMEDIAL DESIGN STUDY.

EPA INTENDS TO LOCATE THE SURFACE WATER DISCHARGE POINTS UPSTREAM OF IDENTIFIED SEEPS OF CONTAMINATED GROUND WATER. THUS, THE TREATED DISCHARGE COULD SERVE TO MINIMIZE ANY ADVERSE STREAM EFFECTS CAUSED BY THE SEEPS OF CONTAMINATED GROUND WATER VIA DILUTION. IN THE EVENT THAT THE AMOUNT OF WATER DISCHARGED FROM THE TREATMENT UNITS EXCEEDS THE AVAILABLE CAPACITY OF THE STREAM CHANNEL, WHICH IS SMALL IN THE VICINITY OF THE SITE, EPA MAY OPT TO MODIFY THE REMEDY AND DISCHARGE WATER FROM A TREATMENT PLANT LOCATED NEAR THE CRYOCHEM, INC. PLANT INTO A DOWNSTREAM ON-SITE AREA, WHERE THE STREAM CHANNEL IS WIDER, OR TO USE A CONTINGENCY TECHNOLOGY, I.E., AQUIFER RECHARGE WELLS, AS NEEDED. THE CONTINGENCY REMEDY IS DISCUSSED LATER IN THIS SECTION.

IN ADDITION TO THE COMPONENTS OF THE SELECTED REMEDIAL ALTERNATIVE DISCUSSED ABOVE, A PRE-DISCHARGE EVALUATION OF THE STREAM BIOTA WOULD BE

CONDUCTED FOR THE PURPOSE OF PROVIDING A BASELINE AGAINST WHICH ANY POTENTIAL IMPACTS OF THE DISCHARGE UPON THE RECEIVING STREAM COULD BE EVALUATED. AN EFFLUENT TOXICITY TEST WOULD BE PERFORMED ON THE TREATED DISCHARGE AND POST-DISCHARGE DOWNSTREAM SAMPLING WOULD BE CONDUCTED TO EVALUATE THE PERSISTENCE OF THE POTENTIAL TOXICANTS DISCHARGED FROM THE TREATMENT UNITS. IN ADDITION, DOWNSTREAM POTENTIALLY SENSITIVE ENVIRONMENTS, IF ANY, WOULD BE FULLY EVALUATED TO DETERMINE IF THE DISCHARGE RESULTS IN ADVERSE IMPACTS.

ONE GOAL OF THIS REMEDIAL ACTION IS TO RESTORE GROUND WATER TO ITS BENEFICIAL USE AS A DRINKING WATER AQUIFER. BASED UPON INFORMATION OBTAINED DURING THE RI/FS AND UPON A CAREFUL ANALYSIS OF ALL THE REMEDIAL ALTERNATIVES, EPA BELIEVES THAT THE SELECTED ALTERNATIVE WILL ACHIEVE THIS GOAL. IF IMPLEMENTATION OF THE SELECTED REMEDY DEMONSTRATES, IN CORROBORATION WITH HYDROGEOLOGICAL AND CHEMICAL EVIDENCE THAT IT WILL BE TECHNICALLY IMPRACTICABLE TO ACHIEVE AND MAINTAIN THE REMEDIATION GOALS THROUGHOUT THE AREA OF ATTAINMENT, THE USEPA IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO AMEND THE ROD OR ISSUE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO INFORM THE PUBLIC OF ALTERNATIVE GROUNDWATER GOALS.

THE SELECTED REMEDY INCLUDES GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE FOR AN ESTIMATED PERIOD OF 30 YEARS, DURING WHICH TIME THE SYSTEM'S PERFORMANCE WOULD BE CAREFULLY MONITORED ON A REGULAR BASIS AND ADJUSTED AS WARRANTED. FOR EXAMPLE, CERTAIN EXTRACTION WELLS COULD BE REMOVED FROM SERVICE OR PUMPED AT HIGHER LEVELS, OR INTERMITTENTLY, TO IMPROVE THE PERFORMANCE OF THE EXTRACTION SYSTEM.

IF IT IS DETERMINED THAT CERTAIN PORTIONS OF THE AQUIFER CANNOT BE RESTORED TO THEIR BENEFICIAL USE, ALL OF THE FOLLOWING MEASURES INVOLVING LONG-TERM MANAGEMENT MAY OCCUR, FOR AN INDEFINITE PERIOD OF TIME, AS A MODIFICATION OF THE EXISTING SYSTEM:

- A) LOW LEVEL PUMPING WOULD BE IMPLEMENTED AS A LONG-TERM GRADIENT CONTROL, OR CONTAINMENT, MEASURE:
- B) CHEMICAL-SPECIFIC ARARS WOULD BE WAIVED FOR THE CLEANUP OF THOSE PORTIONS OF THE AQUIFER BASED ON THE TECHNICAL IMPRACTICABILITY OF ACHIEVING FURTHER CONTAMINANT REDUCTION; AND/OR
- C) INSTITUTIONAL CONTROLS WOULD BE PROVIDED/MAINTAINED TO RESTRICT ACCESS TO THOSE PORTIONS OF THE AQUIFER WHICH REMAIN ABOVE HEALTH-BASED GOALS AND TO ENSURE THAT PUBLIC WELLS ARE ROUTINELY MONITORED AND TREATED AS NECESSARY.

THE DECISION TO INVOKE ANY OR ALL OF THESE MEASURES MAY BE MADE DURING A PERIODIC REVIEW OF THE REMEDIAL ACTION, WHICH WOULD OCCUR AT 5-YEAR INTERVALS.

AN EXPLANATION OF SIGNIFICANT DIFFERENCES WOULD BE ISSUED TO INFORM THE PUBLIC OF THE DETAILS OF THESE ACTIONS IF AND WHEN THEY OCCUR.

AFTER THE REMEDIATION IS COMPLETED, THE LIFETIME EXCESS CANCER RISK

LEVELS POSED BY THE SITE WOULD BE WITHIN THE (10-4) TO (10-6) EXCESS CANCER RISK RANGE CONSISTENT WITH THE NCP. THUS, GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE WOULD CONTINUE UNTIL CLEAN UP GOALS ARE REACHED WITHIN THE AREA OF ATTAINMENT, IF PRACTICABLE.

ALTERNATIVE 2C WOULD MEET THE GROUND WATER CLEANUP GOAL (BACKGROUND) WITHIN THE AREA OF ATTAINMENT, UP TO THE BOUNDARY OF THE CONTAMINATED SOIL LEFT IN PLACE, IF PRACTICABLE; WOULD MEET NPDES DISCHARGE STANDARDS AT THE POINT OF DISCHARGE INTO SURFACE WATER; AND WOULD MEET AMBIENT WATER QUALITY CRITERIA STANDARDS DOWNSTREAM OF THE SURFACE WATER DISCHARGE POINTS.

AFTER THE REMEDIATION IS COMPLETED, THE EXCESS CANCER RISK LEVELS POSED BY THE SITE WOULD BE WITHIN THE (10-4) TO (10-6) EXCESS CANCER RISK RANGE CONSISTENT WITH THE NCP. EPA EXPECTS THAT ALTERNATIVE 2C WOULD REDUCE THE EXCESS CANCER RISK LEVEL LESS THAN OR EQUAL TO $1 \times (10^{-6})$.

ALTERNATIVE 2C COMPLIES WITH ALL ARARS AND PROVIDES A HIGH DEGREE OF PROTECTION FOR A REASONABLE COST. EACH OF THE REMEDIAL OBJECTIVES FOR OU2 WOULD BE MET. THE ESTIMATED COSTS FOR ALTERNATIVE 2C ARE SUMMARIZED IN TABLE 20.

#STD

XII. STATUTORY DETERMINATIONS

THE SELECTED REMEDY WHICH WAS OUTLINED IN SECTION X SATISFIES THE REMEDY SELECTION REQUIREMENTS OF SECTION 121 OF CERCLA (42 USC SECTION 9621) AND THE NCP (40 CFR SECTION 300.430 (E)). THE REMEDY PROVIDES PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT, ACHIEVES COMPLIANCE WITH ARARS, UTILIZES PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE,

CONTAINS TREATMENT AS A PRINCIPAL ELEMENT, AND IS COST EFFECTIVE.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED ALTERNATIVE IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. THE GROUND WATER REMEDIATION WOULD REDUCE CONTAMINANT LEVELS TO BACKGROUND AND/OR HEALTH-BASED LEVELS, WHICHEVER IS LOWER OR MORE PROTECTIVE, IF PRACTICABLE. THE GROUND WATER DISCHARGED FROM THE TREATMENT UNITS INTO SURFACE WATER WOULD BE TREATED TO LEVELS PROTECTIVE OF THE RECEIVING STREAM.

THE RESIDUAL CANCER RISK IS EXPECTED TO BE LESS THAN $1 \times (10^{-6})$, BUT WOULD CERTAINLY BE WITHIN THE (10-4) TO (10-6) RISK RANGE CONSISTENT WITH THE NCP. THE RESIDUAL RISK FROM NON-CARCINOGENIC COMPOUNDS IS EXPECTED TO BE LESS THAN 1. EPA EXPECTS TO MEET THE GROUND WATER CLEANUP GOAL (BACKGROUND) WITHIN THE AREA OF ATTAINMENT, UP TO THE BOUNDARY OF THE CONTAMINATED SOIL LEFT IN PLACE, IF PRACTICABLE.

EPA EXPECTS TO MEET NPDES DISCHARGE STANDARDS AT THE POINT OF DISCHARGE INTO SURFACE WATER. EPA EXPECTS TO MEET AMBIENT WATER QUALITY CRITERIA STANDARDS DOWNSTREAM OF THE SURFACE WATER DISCHARGE POINTS. EPA EXPECTS

TO MEET AIR QUALITY STANDARDS WITHIN 100 METERS OF THE AIR STRIPPING TOWERS.

ALTHOUGH THE SELECTED ALTERNATIVE TRANSFERS CONTAMINANTS FROM THE GROUND WATER INTO THE AIR, PRELIMINARY CALCULATIONS INDICATE THAT THE RESULTING RISK IS WITHIN THE ACCEPTABLE RANGE. EPA WOULD INSTALL AIR CONTROLS SHOULD DESIGN SAMPLING INDICATE THAT THE POTENTIAL RISK POSED TO HUMAN HEALTH IS OUTSIDE THE ACCEPTABLE EXCESS CANCER RISK RANGE OF 1×10^{-4} TO 1×10^{-6} OR IF THE OPERATION PLAN IS NOT APPROVED BY PADER AND AIR EMISSIONS CONTROL ARE REQUIRED. IF AIR CONTROLS MUST BE INSTALLED, THE REMEDY WOULD BE MORE PROTECTIVE OF HUMAN HEALTH SINCE ANY RISK WHICH MAY RESULT FROM LOW LEVELS OF UNCONTROLLED RELEASES OF VOCs WOULD BE ADDRESSED. NO UNACCEPTABLE SHORT-TERM RISKS WOULD RESULT FROM IMPLEMENTATION OF THE SELECTED ALTERNATIVE.

B. COMPLIANCE WITH ARARS

THE SELECTED REMEDY COMPLIES WITH ALL ARARS. THE ARARS FOR ALTERNATIVE 2C ARE IDENTIFIED IN TABLE 22. IN ADDITION, THE VOC EMISSIONS FROM THE AIR STRIPPERS WOULD NOT EXCEED LEVELS IDENTIFIED WITHIN OSWER DIRECTIVE 9355.0-28.

C. COST EFFECTIVENESS

THE SELECTED REMEDY IS COST EFFECTIVE. THE ONLY ALTERNATIVE WHICH PROVIDES MORE PROTECTION IS ALTERNATIVE 2D. ALTERNATIVE 2D UTILIZES CARBON ADSORPTION, RATHER THAN AIR STRIPPING WHICH IS LESS COSTLY, TO TREAT CONTAMINATED GROUND WATER. SINCE THE EMISSIONS FROM THE AIR STRIPPING TOWERS ARE NOT EXPECTED TO EXCEED THE MOST STRINGENT LEVELS TO BE CONSIDERED FOR THE SITE AND ARE NOT EXPECTED TO RESULT IN A RISK TO THE PUBLIC OUTSIDE THE ACCEPTABLE RANGE IDENTIFIED IN THE NCP, ADDITIONAL TREATMENT TO PROVIDE ADDITIONAL PROTECTION IS NOT NECESSARY. IN ADDITION, ALTERNATIVE 2C UTILIZES A SURFACE WATER DISCHARGE, RATHER THAN AQUIFER RECHARGE WELLS WHICH ARE MORE COSTLY AND LESS RELIABLE, TO DISCHARGE TREATED GROUND WATER. THUS, BECAUSE ALTERNATIVE 2C INCLUDES AIR STRIPPING TOWERS AND SURFACE WATER DISCHARGE, IT PROVIDES THE MOST PROTECTION FOR THE MOST REASONABLE COST.

D. UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

THE SELECTED ALTERNATIVE PROVIDES THE HIGHEST LEVEL OF PROTECTION FOR THE MOST REASONABLE COST. THE SELECTED ALTERNATIVE EMPLOYS PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES TO REMOVE CONTAMINANTS FROM GROUND WATER.

THOSE CRITERIA POTENTIALLY AFFECTING THE LONG-TERM OPERATION AND MAINTENANCE OF THE REMEDY (E.G., LONG-TERM EFFECTIVENESS, IMPLEMENTABILITY, AND COST) WERE MOST CRITICAL IN THE SELECTION DECISION. AIR STRIPPING TOWERS AND SURFACE WATER DISCHARGE WERE NOT DIFFICULT TO OPERATE AND MAINTAIN, WERE EASILY IMPLEMENTED, WERE NOT SUBJECT TO FAILURE, AND WERE LESS COSTLY THAN CARBON ADSORPTION UNITS AND AQUIFER RECHARGE WELLS. YET, AIR STRIPPING TOWERS AND SURFACE WATER DISCHARGE OPTIONS PROVIDED SIMILAR PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, AQUIFER RECHARGE WELLS COULD POTENTIALLY

SPREAD THE CONTAMINANTS INTO CURRENTLY UNAFFECTED AREAS.

THE COMMONWEALTH OF PENNSYLVANIA AND THE PUBLIC SUPPORTED EPA'S SELECTION OF TREATMENT BY AIR STRIPPING AND DISCHARGE TO SURFACE WATER.

E. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE SELECTED REMEDY UTILIZES PROVEN AND READILY AVAILABLE TREATMENT TECHNOLOGIES TO REDUCE THE GROUND WATER RISKS POSED BY THE SITE.

#RS

RESPONSIVENESS SUMMARY

A. OVERVIEW

EPA'S PREFERRED REMEDIAL ALTERNATIVE FOR CONTAMINATED GROUND WATER (OPERABLE UNIT 2) WAS OUTLINED IN THE PROPOSED PLAN AND RELEASED TO THE PUBLIC ON AUGUST 6, 1990. DURING A 30-DAY PUBLIC COMMENT PERIOD (AUGUST 6, 1990 THROUGH SEPTEMBER 11, 1990) AND DURING A PUBLIC MEETING CONDUCTED AUGUST 20, 1990, THE PUBLIC WAS PROVIDED THE OPPORTUNITY TO SUBMIT COMMENTS ON EPA'S PREFERRED ALTERNATIVE. IN GENERAL, THE PUBLIC PROVIDED COMMENTS WHICH SUPPORTED EPA'S PREFERENCE TO TREAT GROUND WATER BY AIR STRIPPING AND TO DISCHARGE TREATED GROUND WATER INTO THE NEARBY STREAM. NO WRITTEN COMMENTS WERE RECEIVED BY EPA DURING THE COMMENT PERIOD. ALL COMMENTS WERE DELIVERED AT THE PUBLIC MEETING. BASED UPON A COMPARATIVE ANALYSIS OF SEVERAL REMEDIAL ALTERNATIVES AND UPON PUBLIC COMMENTS RECEIVED DURING THE 30-DAY COMMENT PERIOD, EPA SELECTED ALTERNATIVE 2C; GROUND WATER EXTRACTION, TREATMENT BY AIR STRIPPING, DISCHARGE TO SURFACE WATER; FOR OPERABLE UNIT 2 OF THE CRYOCHEM SITE. THE RECORD OF DECISION (ROD) DETAILS THE REMEDIAL ALTERNATIVE SELECTED BY EPA.

B. SUMMARY OF COMMENTS

THE PUBLIC COMMENT PERIOD WAS HELD FROM AUGUST 6, 1990 TO SEPTEMBER 11, 1990. A PUBLIC MEETING WAS HELD AUGUST 28, 1990. A STENOGRAPHIC REPORT OF THE PUBLIC MEETING WAS PREPARED BY EPA. NO WRITTEN COMMENTS WERE RECEIVED BY EPA DURING THE COMMENT PERIOD. ALL COMMENTS WERE RECEIVED AT THE PUBLIC MEETING AND ARE CONTAINED WITHIN A STENOGRAPHIC REPORT OF PUBLIC HEARING HELD AT THE EARL TOWNSHIP MUNICIPAL BUILDING, ROUTE 73, BOYERTOWN, PENNSYLVANIA, AUGUST 28, 1990.

COMMENTS CONCERNING OU2 RAISED AT THE PUBLIC MEETING ARE SUMMARIZED BELOW. FOLLOWING EACH COMMENT SUMMARY IS EPA'S RESPONSE.

COST/FUNDING ISSUES

EPA RECEIVED COMMENTS CONCERNING WHO WOULD OPERATE AND PAY FOR THE REMEDY THAT EPA SELECTED FOR OU2.

EPA RESPONSE: UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA), AS AMENDED, EPA HAS THE AUTHORITY TO REQUIRE RESPONSIBLE PARTIES TO PAY FOR ENVIRONMENTAL

CLEANUP OR TO REIMBURSE THE GOVERNMENT FOR THE COSTS IT INCURS RESPONDING TO CONTAMINATION. EPA WILL PROVIDE THE PARTIES POTENTIALLY RESPONSIBLE FOR THE CONTAMINATION OF GROUND WATER AT THE SITE THE OPPORTUNITY TO OPERATE AND PAY FOR THE SELECTED REMEDY. IF THESE PARTIES ARE UNABLE OR UNWILLING TO DO SO, EPA WILL IMPLEMENT THE REMEDY AND ATTEMPT TO RECOVER ITS COSTS FROM THESE PARTIES.

DECISION - MAKING PROCESS

EPA RECEIVED COMMENTS CONCERNING THE LENGTH OF TIME WHICH PASSED BEFORE ANY RESPONSE ACTION WAS TAKEN AT THE SITE.

EPA RESPONSE: PRIOR TO IMPLEMENTING A REMEDY AT A SUPERFUND SITE, EPA IS REQUIRED, PURSUANT TO THE NCP, TO CONDUCT STUDIES INTENDED TO DETERMINE THE NATURE AND EXTENT OF CONTAMINATION AT A SITE, THE RISKS POSED BY THAT CONTAMINATION, AND A RANGE OF ALTERNATIVES FOR RESPONDING TO THE RISKS POSED BY THE SITE. UPON COMPLETION OF THESE STUDIES, EPA CAN THEN SELECT THE ALTERNATIVE WHICH BEST ADDRESSES THE RISKS POSED BY THE SITE FOR THE MOST REASONABLE COSTS. IN ORDER FOR EPA TO EXPEND PUBLIC FUNDS ADDRESSING THE REMEDIATION OF THE SITE CONTAMINATION, THE SITE MUST FIRST BE LISTED ON THE NATIONAL PRIORITIES LIST(NPL). THIS SITE WAS LISTED ON THE NPL IN OCTOBER 1989. PRIOR TO OCTOBER 1989, THE WORK CONDUCTED AT THE SITE TO DETERMINE APPROPRIATE RESPONSE ACTIONS FOR CONTAMINATED GROUND WATER WAS CONDUCTED BY THE POTENTIALLY RESPONSIBLE PARTIES.

TECHNICAL CONCERNS REGARDING ALTERNATIVES

1. EPA RECEIVED COMMENTS CONCERNING THE LENGTH OF TIME FOR THE SITE TO BE CLEANED.

EPA RESPONSE: THE CONTAMINANTS HAVE MIGRATED A LONG WAY IN THE GROUND WATER SYSTEM. IT IS VERY DIFFICULT AND A LENGTHY PROCESS TO REMOVE THESE CONTAMINANTS SINCE THEY ARE DISPERSED IN MILLIONS OF GALLONS OF WATER AND MOST LIKELY ADSORBED, IN PART, ONTO AQUIFER MATERIAL. THE GROUND WATER REMEDIATION WOULD CONTINUE UNTIL THE AQUIFER IS RESTORED.

2. EPA RECEIVED COMMENTS REGARDING THE PROPOSED LOCATION OF THE GROUND WATER TREATMENT UNITS. CONCERNS WERE RAISED ABOUT THE LOCATION OF THESE UNITS IN A RESIDENTIAL AREA. POSSIBLE EXCESS NOISE FROM THE AIR STRIPPER WAS ALSO A CONCERN.

EPA RESPONSE: THE ACTUAL LOCATION OF THE GROUND WATER TREATMENT UNITS WOULD BE DETERMINED DURING THE DESIGN STAGE OF THE RESPONSE ACTION. THE EXTRACTION WELLS WOULD GO IN THE AREAS OF HIGH CONTAMINATION AND IN AREAS WHERE THE CONTAMINANTS ARE MIGRATING FROM THE SITE. THE TREATMENT UNITS CAN BE PLACED ALMOST ANYWHERE. EPA WOULD NOT LOCATE THE AIR STRIPPING TOWER WITHIN THE RESIDENTIAL AREA IF POSSIBLE. THE UNITS CAN BE DESIGNED TO BE QUIET.

3. EPA RECEIVED COMMENTS CONCERNING THE EXTENT OF CONTAMINATION. SPECIFICALLY THE COMMENTATOR WANTED TO KNOW IF OTHER SOURCES OF CONTAMINATION ARE KNOWN OR IF THE CONTAMINATION IN RESIDENTIAL WELLS ORIGINATED FROM CRYOCHEM, INC.

EPA RESPONSE: ALTHOUGH THERE APPEARS TO BE AN UPGRADIENT SOURCE OF TCE CONTAMINATION, THE SAMPLING DATA SUPPORT THE CONCLUSION THAT THE CRYOCHEM, INC. PLANT CAUSED CONTAMINATION OF RESIDENTIAL WELLS DOWNGRADIENT TO THE PLANT.

#TA

TABLE 1

SUMMARY OF CONTAMINANTS
IN SURFACE SOIL
(SAMPLE #17)

CONTAMINANT	CONCENTRATION
TCA	22,000 UG/KG
DCA	4,200 UG/KG
PCE	460 UG/KG
TCE	60 UG/KG
XYLENES	11,000 UG/KG
ETHYL BENZENE	920 UG/KG

TABLE 2

CONCENTRATIONS OF CONTAMINANTS
THAT COULD REMAIN IN SOIL

CONTAMINANT	CONCENTRATION
TCA	23,100 UG/KG
DCA	8.6 UG/KG
PCE	190 UG/KG
TCE	306 UG/KG
XYLENE	1,824,000 UG/KG
ETHYL BENZENE	585,200 UG/KG

TABLE 3

HIGHEST CONCENTRATIONS OF CONTAMINANTS
IDENTIFIED IN GROUND WATER MONITORING WELLS

CONTAMINANT	MCL*	CONCENTRATION	LOCATION
TCA	200 UG/L	280 UG/L	RI-1S
DCA		19 UG/L	CC-2
PCE	5 UG/L	8 UG/L	RI-1S
TCE	5 UG/L	14 UG/L	RI-1S
DCE	7 UG/L	62 UG/L	RI-1S

* MCL FOR PCE IS PROPOSED

TABLE 4

MEAN AND MAXIMUM CONCENTRATION OF CONTAMINANTS
IDENTIFIED IN DOWNGRADIENT RESIDENTIAL WELLS

CONTAMINANT	MCL*	MAXIMUM	MAXIMUM MEAN**
TCA	200 UG/L	1052 UG/L	516 UG/L
DCA		130 UG/L	22.5 UG/L
PCE	5 UG/L	15 UG/L	7.5 UG/L
TCE	5 UG/L	37 UG/L	13 UG/L
DCE	7 UG/L	1734 UG/L	380.6 UG/L

* MCL FOR PCE IS PROPOSED

** MAXIMUM MEAN IS THE HIGHEST MEAN CONCENTRATION
IDENTIFIED IN INDIVIDUAL RESIDENTIAL WELLS.

TABLE 5

SUMMARY OF STREAM/SEDIMENT SAMPLING

CONTAMINANT	CONCENTRATION
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SURFACE WATER

TCA	150 UG/L
DCA	5 UG/L
DCE	7 UG/L

SEDIMENT

TCA	13 UG/KG
DCA	3 UG/KG

TABLE 6

CONTAMINANTS OF CONCERN AND AFFECTED MEDIA

CONTAMINANT	AFFECTED MEDIA
1,1,1-TRICHLOROETHANE (TCA)	GROUND WATER SURFACE WATER
1,1-DICHLOROETHANE (DCA)	GROUND WATER SURFACE WATER SOIL
TETRACHLOROETHENE (PCE)	GROUND WATER SOIL
TRICHLOROETHENE (TCE)	GROUND WATER

1,1-DICHLOROETHENE (DCE) GROUND WATER
 SURFACE WATER

TABLE 7

SUMMARY OF EXPOSURE PATHWAYS

CONTAMINATED MEDIA	EXPOSURE PATHWAY
GROUND WATER	INGESTION (DRINKING) INHALATION (SHOWERING)
SURFACE WATER	INGESTION (RECREATION) DERMAL CONTACT (SWIMMING) FISH INGESTION
SOIL	INGESTION (CHILD TRESPASS) DERMAL CONTACT INHALATION (WORKERS)

TABLE 8

EXPOSURE ASSESSMENT ASSUMPTIONS

ADULT MASS (KG)	:	70
CHILD MASS (AGE 3-6)(KG)	:	17
LENGTH OF LIFETIME (YRS)	:	75
LENGTH OF ADULT EXPOSURE (YRS)	:	30
LENGTH OF CHILD EXPOSURE (YRS)	:	4
TAP WATER CONSUMED (L/D)	:	2
FISH CONSUMED (G/D)	:	35
SURFACE WATER INGESTED (L/D)		
ADULT	:	0.01
CHILD	:	0.1
RECREATION EVENTS/YEAR, ADULT	:	30
RECREATION EVENTS/YEAR, CHILD	:	60
REC. EVENT DURATION (HOUR)	:	1
SKIN SURFACE AREA, ADULT (CM SQR):		18150
SKIN SURFACE AREA, CHILD (CM SQR):		7540
SOIL INGESTION (MG/EVENT)	:	200
SOIL INGESTION EVENTS/YEAR	:	10

* TAP WATER CONCENTRATION IS 90 PERCENT UPPER BOUND CONFIDENCE LEVEL OF THE MEAN CONCENTRATION

* SURFACE WATER CONCENTRATION IS THE MAXIMUM OBSERVED CONCENTRATION

TABLE 9

CANCER POTENCY FACTORS (CPFS) AND
REFERENCE DOSES (RFDs) FOR CONTAMINANTS
OF CONCERN

CONTAMINANT	ORAL	INHALED	ORAL	INHALED
	RFD	RFD	CPF	CPF
	(MG/KG/D)		(MG/KG/D) (-1)	
TCA	9X(10-2)	NA	NA	NA
DCA	1.2X(10-1)	1.38X(10-1)	9.1X(10-2)	9.1X(10-2)
PCE	1X(10-2)	NA	5.1X(10-2)	3.3X(10-3)
TCE	NA	NA	1.1X(10-2)	1.3X(10-2)
DCE	9X(10-3)	NA	6X(10-1)	1.2

NA = NOT AVAILABLE

TABLE 10

CANCER RISKS POSED BY THE CRYOCHEM SITE
CURRENT EXPOSURES

EXPOSURE RISK

INCIDENTAL SURFACE WATER INGESTION

CHILD	2.48X(10-7)
ADULT	2.26X(10-8)
CHILD+ADULT	2.71X(10-7)

DERMAL CONTACT WITH SURFACE WATER

CHILD	1.63X(10-5)
ADULT	3.57X(10-5)
CHILD+ADULT	5.20X(10-5)

FISH INGESTION

CHILD	3.11X(10-6)
ADULT	5.67X(10-6)
CHILD+ADULT	8.78X(10-6)

ALL CURRENT EXPOSURE ROUTES COMBINED

CHILD	1.96X(10-5)
ADULT	4.14X(10-5)
CHILD+ADULT	6.10X(10-5)

TABLE 11

CANCER RISKS POSED BY THE CRYOCHEM SITE
POTENTIAL FUTURE EXPOSURES

EXPOSURE	RISK
DRINKING WATER	
CHILD	1.45 X (10 ⁻³)
ADULT	2.64 X (10 ⁻³)
CHILD+ADULT	4.09 X (10 ⁻³)
INHALATION WHILE SHOWERING	
CHILD	2.88 X (10 ⁻³)
ADULT	5.25 X (10 ⁻³)
CHILD+ADULT	8.13 X (10 ⁻³)
ALL FUTURE EXPOSURE PATHWAYS COMBINED	
CHILD	4.33 X (10 ⁻³)
ADULT	7.89 X (10 ⁻³)
CHILD+ADULT	1.22 X (10 ⁻²)

TABLE 12

CANCER RISKS POSED BY THE CRYOCHEM SITE
ALL EXPOSURE PATHWAYS

EXPOSURE	RISK
CHILD	4.35 X (10 ⁻³)
ADULT	7.93 X(10 ⁻³)
CHILD+ADULT	1.23 X(10 ⁻²)

TABLE 13

CURRENT EXPOSURE HAZARD INDEXES (HI)

EXPOSURE	HAZARD INDEX
INCIDENTAL SURFACE WATER INGESTION	
CHILD	2.65 X (10 ⁻³)
ADULT	3.43 X (10 ⁻⁶)
DERMAL CONTACT WITH SURFACE WATER	
CHILD	1.74 X (10 ⁻¹)
ADULT	5.07 X (10 ⁻²)
FISH INGESTION	
CHILD	4.43 X (10 ⁻²)
ADULT	1.07 X (10 ⁻²)

ALL CURRENT EXPOSURE ROUTES COMBINED

CHILD	2.21 X (10 ⁻¹)
ADULT	6.14 X (10 ⁻²)

TABLE 14

POTENTIAL FUTURE EXPOSURE HAZARD INDEXES

EXPOSURE	HAZARD INDEX
DRINKING WATER	
CHILD	5.76
ADULT	1.40
INHALATION WHILE SHOWERING	
CHILD	1.92 X (10 ⁻²)
ADULT	4.67 X (10 ⁻³)
ALL FUTURE EXPOSURE PATHWAYS COMBINED	
CHILD	5.78
ADULT	1.40

TABLE 15

HAZARD INDEXES FOR ALL EXPOSURE ROUTES

CHILD	6.00
ADULT	1.47

TABLE 16

REMEDIAL OBJECTIVES FOR OU2

1. PROTECT PUBLIC HEALTH, WELFARE, OR ENVIRONMENT
2. PREVENT FURTHER OFF-SITE MIGRATION OF CONTAMINANTS IN GROUND WATER AND SURFACE WATER
3. PREVENT CONTAMINANT MIGRATION INTO UNAFFECTED AREAS
4. RESTORE THE AQUIFER TO BENEFICIAL USE, IF PRACTICABLE

TABLE 22

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
AND TO-BE-CONSIDERED (TBC) REQUIREMENTS

CHEMICAL SPECIFIC

SAFE DRINKING WATER ACT (42 USC SECTION 300(F))

<p>MAXIMUM CONTAMINANT LEVELS (MCLS) (40 CFR SECTION 141.11-141.16)</p> <p>TCA - .200 MG/L TCE - .005 MG/L DCE - .007 MG/L</p>	<p>FOR WATER THAT IS TO BE USED FOR DRINKING, THE MCLS ARE RELEVANT AND APPROPRIATE STANDARDS. THE AQUIFER SHOULD BE CLEANED TO THESE LEVELS, IF PRACTICABLE, IN ORDER TO RETURN TO BENEFICIAL USE.</p>
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<p>PROPOSED MAXIMUM CONTAMINANT LEVELS (PMCLS)</p> <p>PCE - .005 MG/L</p>	<p>FOR WATER THAT IS TO BE USED FOR DRINKING AND AN MCL IS NOT YET ESTABLISHED, A PMCL MAY BE RELEVANT AND APPROPRIATE.</p>
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CLEAN WATER ACT (33 USC SECTION 1251)

<p>FEDERAL WATER QUALITY CRITERIA (FWQC) (QUALITY CRITERIA FOR WATER, 1986, 51 FED. REG. 43665) PROTECTION OF HUMAN HEALTH</p>	<p>FEDERAL STANDARDS WHICH MUST BE MET IN THE STREAM ADJACENT TO THE CRYOCHEM SITE. THESE STANDARDS ARE RELEVANT AND APPROPRIATE SINCE EDIBLE FISH ARE RAISED IN THE STREAM AND THE STREAM MAY BE USED FOR RECREATIONAL PURPOSES.</p>
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<p>WATER AND FISH INGESTION</p>	<p>FISH CONSUMPTION</p>
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DCE - .000033 MG/L	.0019 MG/L
PCE - .0008 MG/L	.0089 MG/L
TCA - 18 MG/L	1000 MG/L
TCE - .0027 MG/L	.0081 MG/L

PENNSYLVANIA CHEMICAL-SPECIFIC ARARS

<p>CLEAN STREAMS LAW (25 PA CODE SECTION 93.1 ET SEQ.)</p> <p>WATER QUALITY STANDARDS</p>	<p>STATE STANDARDS FOR THE QUALITY OF PENNSYLVANIA'S SURFACE WATER</p>
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ACTION SPECIFIC

CLEAN AIR ACT (PART D)
(42 USC SECTIONS 7401-7642)

NATIONAL AMBIENT AIR
QUALITY STANDARDS (NAAQS)
(40 CFR PART 50)

THE NAAQS FOR OZONE SHOULD NOT
BE EXCEEDED MORE THAN 1 TIME PER

OZONE - 0.12 PPM (1 HOUR)

YEAR. VOCs ARE PRECURSORS TO
THE DEVELOPMENT OF GROUND-LEVEL
OZONE. PERTAINS TO USE OF AIR
STRIPPERS.

RESOURCE CONSERVATION AND RECOVERY ACT
(42 USC SECTION 6901 ET SEQ.)

LAND DISPOSAL RESTRICTIONS
(40 CFR 268.1-268.50)

REQUIRES USE OF SPECIFIC
TECHNOLOGY TO TREAT SPECIFIC
HAZARDOUS WASTES. SPENT CARBON
FROM CARBON ADSORPTION UNITS IS
MOST LIKELY A CHARACTERISTIC RCRA
WASTE.

GENERAL HANDLING, TRANSPORTATION
OF HAZARDOUS WASTE
(40 CFR PARTS 262, 263)

TRANSPORTATION AND HANDLING OF
CHARACTERISTIC HAZARDOUS WASTES
TO COMPLY WITH ALL REQUIREMENTS
OF RCRA. THE SPENT CARBON FROM
THE CARBON ADSORPTION UNITS WOULD
MOST LIKELY BE A CHARACTERISTIC
RCRA HAZARDOUS WASTE.

UNDERGROUND INJECTION
CONTROL REGULATIONS
(40 CFR PARTS 144, 145, 146, 147)

PROVIDES REGULATIONS GOVERNING
INJECTION OF TREATED WATER BACK
INTO THE AQUIFER (CLASS IV WELL).
INJECTED WATER COULD NOT EXCEED
DRINKING WATER STANDARDS.

PENNSYLVANIA ACTION-SPECIFIC ARARS

25 PA CODE SECTIONS 127.1 ET SEQ.

REQUIRES THAT AIR EMISSIONS FROM
NEW SOURCES, SUCH AS AIR
STRIPPING TOWERS, BE CONTROLLED
WITH BEST AVAILABLE TECHNOLOGY.
IN ADDITION APPROVAL IS REQUIRED
FOR ANY AIR STRIPPING/SOIL
VENTING PLAN.

25 PA CODE SECTIONS 92.1 ET SEQ.

SETS FORTH PROVISIONS FOR THE
NPDES PROGRAM ADMINISTRATION
WITHIN PENNA. PADER WOULD SET
DISCHARGE LIMITATIONS BASED UPON
THE DESIGNATED USES OF THE
RECEIVING STREAM AND
SITE-SPECIFIC PARAMETERS RELATED

TO THE DESIGN OF THE PROPOSED
TREATMENT SYSTEM.

25 PA CODE SECTION 264.90-264.100 REQUIRES THAT ALL GROUND WATER
MUST BE REMEDIATED TO BACKGROUND
QUALITY.

REQUIREMENTS TO-BE-CONSIDERED

EPA OSWER DIRECTIVE 9355.0-28
AIR STRIPPER CONTROL POLICY SUGGESTS THAT TOTAL VOC RELEASES
FROM AIR STRIPPERS SHOULD NOT
EXCEED 3 LBS/HR.

TABLE 23

CRYOCHEM SUPERFUND SITE
SUMMARY OF ESTIMATED COSTS

ALTERNATIVE (FS REFERENCE)	CAPITAL COST (\$)	ANNUAL O&M COST (\$)	PRESENT WORTH COST (\$)	IMPLEMENTATION TIME (MONTHS)
1. NO ACTION / NO FURTHER ACTION	N/A	14,100		N/A
2A. EXTRACTION AIR STRIPPING RECHARGE WELLS (11AA(2))	2,003,000	97,600	2,923,000	10-16
2B. EXTRACTION CARBON ADSORB. RECHARGE WELLS (11AB(2))	2,152,000	167,700	3,086,000	10-16
2C. EXTRACTION AIR STRIPPING SURFACE WATER (11AA(1))	1,356,000	75,200	2,065,000	10-16
2D. EXTRACTION CARBON ADSORB. SURFACE WATER (11AB(1))	1,507,000	145,300	2,877,000	10-16